

Review of the Squirrelfishes (Subfamily Holocentrinae: Order Beryciformes) of Japan, with a Description of a New Species

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Abstract The taxonomy of the species of the subfamily Holocentrinae from Japan and some species from the western Pacific is reviewed and keys to the following fourteen species of *Adioryx* and four species of *Flammeo* are presented: *Adioryx furcatus*, *A. spinifer*, *A. caudimaculatus*, *A. cornutus*, *A. spinosissimus*, *A. ruber*, *A. lacteoguttatus*, *A. tiere*, *A. diadema*, *A. ittodai*, *Flammeo argenteus*, *F. sammara*, *F. opercularis*, *F. scythrops* from Japan; *Adioryx violaceus*, *A. microstomus*, *A. tiereoides* from outside of Japan; and a new species *Adioryx dorsomaculatus* from Japan.

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Introduction

The squirrelfishes and soldierfishes, family Holocentridae, are distributed worldwide from tropical to warm temperate waters in shallow water on coral reefs or rocky bottoms. They are nocturnal fishes with large eyes, brilliant coloration with red predominating and spiny squamation.

The family has been divided into two subfamilies, Holocentrinae and Myripristinae, based on the communication between the swim bladder and skull (Nelson, 1955). Woods and Sonoda (1973) have also recognized these subfamilies in a recent review of the western Atlantic holocentrids. These two stems are recognized in fossil beryciforms (Dunkle and Olsen, 1959) and fossil otoliths (Frizzell and Lamber, 1961; Lamber, 1963).

Taxonomic studies on the Holocentridae from the Indo-Australian Archipelago have been carried out by Bleeker (1873a, b) and Weber and de Beaufort (1929), on Taiwan by Yu (1963), in the Philippines by Montilla (1938) and in New Guinea by Munro (1967).

There are several taxonomic studies on the Holocentridae from Japan: Jordan and Fowler (1903); Aoyagi (1941, 1943); Matsubara (1955), who listed 15 holocentrid fishes of Japan from the literature; and Araga (1964). These works, however, are not comprehensive. "Coastal fishes of southern Japan" (Masuda, Araga and Yoshino, 1975) illustrates almost all the species of holocentrine fishes from

Japan from excellent color photographs, however, the text is limited.

The confusion in taxonomy of this subfamily has been caused by the numerous nominal species, their incomplete descriptions, loss of holotypes, and arbitrary synonymies.

The present study of the Holocentrinae of Japan is a result of cooperative research by the authors for several years. A review of the Japanese Myripristinae will be treated in separate papers.

Methods and materials

Methods: Measurements and counts follow Hubbs and Lagler (1947), except for the scales above the lateral-line. These are counted from the scale just above the lateral-line to the origin of the third dorsal spine. The uppermost scale is designated as a half scale; it is a quarter to three-quarters the size of a normal-size scale. Lateral-line scale counts are of the number of perforated scales. Vertical fin ray counts are made by radiographs to gain accurate numbers. The first dorsal-fin ray is segmented and unbranched, the first pectoral-fin ray is spinous, and the second pectoral-fin ray is segmented and unbranched. They are counted as one of the complete rays such as other segmented and branched ones, and represented by an Arabic numeral

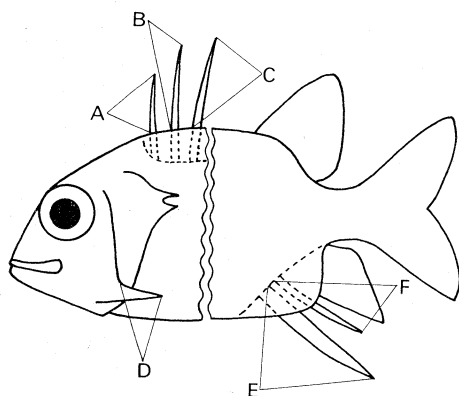


Fig. 1. Diagrammatic illustration to show the measuring methods of spines. Basal groove (indicated by broken lines) of spinous dorsal and anal fins are highly exaggerated. A~C, length of first to third dorsal spines, respectively; D, preopercular spine length; E, F, length of third and fourth anal spines, respectively.

as per Woods and Sonoda (1973). Measuring methods of spines are shown in Fig. 1.

Abbreviations of depositories: AM, The Australian Museum, Sydney; ANSP, The Academy of Natural Sciences of Philadelphia; BMNH, British Museum (Natural History), London; BPBM, Bernice P. Bishop Museum, Honolulu; BSKU, Department of Biology, Faculty of Sciences, Kochi University; HUMZ, Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University; KSHS, Kochi Senior High School; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; USNM, U.S. National Museum, Washington, D.C.; ZMA, Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Universiteit van Amsterdam; ZUMT, Department of Zoology, University Museum, University of Tokyo.

Key to the subfamilies

- A₁ Anal-fin rays 7~10. Angle of preopercle with a stout spine longer than its width Holocentrinae
- A₂ Anal-fin rays more than 10. Angle of preopercle without spine in adult (Atlantic species *Coniger spinosus* has one or two strong spines) Myripristinae

Subfamily Holocentrinae

Diagnosis. Anal-fin rays 7~10. Otophysic connection absent.

Characters. Angle of preopercle with a distinct spine longer than its width at base in young and adult. Dorsal-fin with 11 spines, the third or fourth the longest. First pectoral-fin ray spinous and short, second and last segmented and unbranched, others segmented and branched. Pelvic-fin with one spine and seven rays. Anal-fin with four spines, first and second minute, third longest and stout, fourth shorter than the third. Caudal-fin 5+1+1+9+8+1+1+4 (spinous procurent rays+slender, segmented procurent ray+segmented, unbranched principal ray+upper branched principal rays+lower branched principal rays+segmented, unbranched principal ray+slender, segmented procurent ray+spinous procurent rays). Branchiostegals eight. Vertebrae 11+16=27. Opercle with distinct spine(s) on its posterior margin. Scales

ctenod. Scales 2.5 or 3.5 above, 7~10 below lateral-line. Cheek with four or five, usually five scale rows. Opercle with one scale row. Head and jaws scaleless. Pectoral-fin base scales small, pectoral axil scaleless. Basal scales of soft dorsal-fin rather small. Two scales of pelvic-fin axil elongate. Basal scales of soft anal-fin enlarged and elongate. Caudal-fin lobes with small scales, other fins scaleless.

Key to the genera

(Fig. 2)

- A₁ Last dorsal-fin spine located at middle between the first dorsal-fin ray and the penultimate dorsal-fin spine *Adioryx*
- A₂ Last dorsal-fin spine located nearer to the first dorsal-fin ray than the penultimate dorsal-fin spine *Flammeo*

Genus *Adioryx* Starks, 1908

(Fig. 2A)

(Japanese name: Ittodai zoku)

Adioryx Starks, 1908: 64, type species, by original designation, *Holocentrum suborbitale* Gill, 1864: 86.

Sargocentron Fowler, 1904b: 235, type species, by original designation, *Holocentrum leo* Cuvier, 1829: 204.

Faremusca Whitley, 1933: 68, type species, by original designation, *Holocentrum punctatissimum* Cuvier, 1829: 215.

Diagnosis. Last dorsal-fin spine centrally located between the first dorsal-fin ray and the penultimate dorsal-fin spine. Tip of soft dorsal-fin and both caudal-fin lobes not elongate.

Synonymy. The subgenus *Sargocentron* was erected by Fowler (1904b) for *Holocentrum leo* Cuvier; thereafter he (1944) elevated it to generic rank. Since *H. leo* is a synonym of *H. spinifer* (see synonymy of *A. spinifer*), the latter is the type species of the subgenus and genus *Sargocentron*. Woods (1955) grouped *leo*, *tiereoides*, *spinosissimus* and *ensifer* in the subgenus *Sargocentron* with the statement of their common characters "large size, the body deep and squarish, the spiny dorsal fin high." This subgenus is also recognized by Frizzell

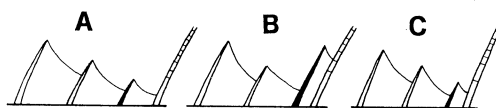


Fig. 2. Diagrammatic illustration to show the length and position of last dorsal-fin spine in species of *Adioryx* and *Flammeo*. The last dorsal spine is in solid black. A: All species of *Adioryx*. B: *F. argenteus*, *F. sammarra*, *F. opercularis*. C: *F. scythrops*, *F. marianus*. In A the last dorsal-fin spine is located at middle between first dorsal ray and penultimate dorsal spine. In B and C, the last dorsal-fin spine is located nearer to first dorsal ray than penultimate dorsal spine. In B the last dorsal-fin spine is longer than the penultimate one.

and Lamber (1961). On our examination of *A. spinifer*, we could not produce any satisfactory reasons to separate it from other species of *Adioryx*, except for 3.5 scales above lateral-line. This character is shared only with *A. furcatus* (= *ensifer*, see synonymy of *A. furcatus*). Therefore, if the subgenus or genus *Sargocentron* is valid, it should include only *spinifer* and *furcatus*; however, *A. furcatus* is the only species with the spinous dorsal-fin membranes almost not incised. On the other hand, *A. spinifer* resembles *A. caudimaculatus* in its general body contour. Therefore, there is no clear evidence to separate *A. spinifer* and *A. furcatus* from other species. Moreover, there is no common character separating *A. spinifer*, *A. tiereoides*, *A. spinosissimus* and *A. furcatus* from other species. We do not recognize the validity of the genus

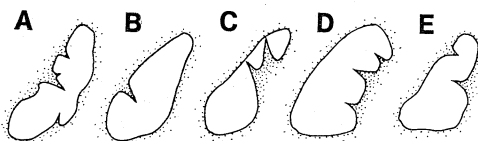


Fig. 3. Nostril spinules in five species of *Adioryx*. Anterior opening of nostril is omitted. A: *A. furcatus*, HUMZ 40458. B: *A. caudimaculatus*, HUMZ 41401. C: *A. dorsomaculatus*, HUMZ 41396. D: *A. cornutus*, HUMZ 40508. E: *A. violaceus*, ZUMT 54055.

and subgenus *Sargocentron*.

The subgenus *Faremusca* was proposed for *Holocentrum punctatissimum* by Whitley (1933). Fowler (1944) elevated it to generic rank for *A. lacteoguttata* (*A. punctatissimum* is a junior synonym of *A. lacteoguttatus*), and he (1946) added *ittodai* to this genus. In 1949, however, he synonymized his *Faremusca* with *Holocentrus*, without comment. We cannot find any common characters separating *A. lacteoguttatus* and *A. ittodai* from other species of *Adioryx*, and therefore conclude that the genus and subgenus *Faremusca* are not valid.

Significant taxonomic features. Among the species of *Adioryx*, the following characters are of diagnostic importance: Spination on nostril, on posterior portion of nasal bone, and on upper margin of first suborbital bone; shape of the tip of nasal bone; adult size; and presence or absence of pigmentation on spinous dorsal-fin membranes.

Nostril spination: The nostril in some species has one or more spinules on its anterior and/or posterior margin. *Adioryx furcatus*, *A. caudimaculatus*, *A. dorsomaculatus*, *A. cornutus* and *A. violaceus* have such spi-

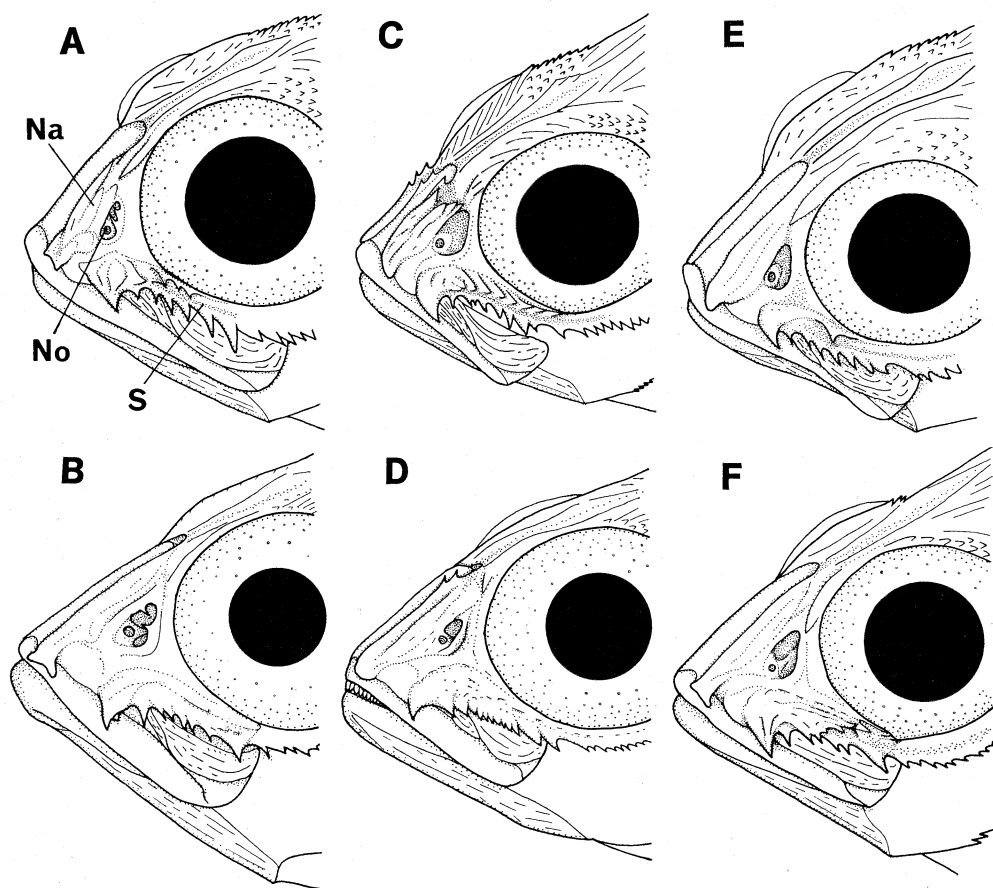


Fig. 4. Head of six species of *Adioryx* to show the spination and serratation. Na, nasal bone; No, nostril; S, first suborbital bone. A: *A. dorsomaculatus*, HUMZ 41396, 138.2 mm SL. B: *A. violaceus*, ZUMT 54055, 108.2 mm SL. C: *A. spinosissimus*, KSHS 16585, 153.9 mm SL. D: *A. microstomus*, HUMZ 40298, 95.8 mm SL. E: *A. ruber*, HUMZ 47948, 137.9 mm SL. F: *A. tiereoides*, HUMZ 40283, 102.9 mm SL. A and B have nostril spinules; C~F do not. C and D have spinules on posterior portion of nasal bone; others do not. E and F have no spinules on nostril and posterior portion of nasal bone. A, C and E have a spine or serration on upper margin of first suborbital bone; B, D and F lack this. A, B and F have nasal bone with two divergent spines on anterior tip; C~E with blunt tip of this bone.

nules (Fig. 3), whereas the other nine species lack them.

Nasal bone spination: The posterior portion of the nasal bone of two species has some spinules. *Adioryx spinosissimus* has several spinules on the posterior portion of the nasal bone (Fig. 4C). *A. microstomus* has one or two spinules on the postero-medial margin of the nasal bone (Fig. 4D), and the nasal bone spination does not occur in the other twelve species.

Serration and spination on the upper margin of the first suborbital bone: Serration on the upper margin of this bone is present in *A. dorsomaculatus* and *A. spinosissimus* (Fig. 4A, C). *Adioryx ruber* is the only species with a stout spine projecting horizontally on this bone (Fig. 4E), and the upper margin of this bone is smooth in the other eleven species.

Nasal bone tip: The anterior tip of the nasal bone is round or ends in two divergent spines. *Adioryx caudimaculatus*, *A. dorsomaculatus*, *A. violaceus*, *A. tiereoides* and *A. tiere* have two divergent spines (Fig. 4A, B, F), whereas the other nine species have a round anterior tip of this bone (Fig. 4C, D, E).

Adult size: The 11 species of *Adioryx* from Japan are divided into three groups according to their adult size. *Adioryx furcatus*, *A. spinifer*, *A. ruber* and *A. tiere* exceed 25 cm in maximum standard length (SL), *A. lacteoguttatus*, *A. diadema* and *A. ittodai* do not exceed 15 cm SL, and *A. caudimaculatus*, *A. dorsomaculatus*, *A. cornutus* and *A. spinosissimus* are of intermediate size.

Pigmentation of spinous dorsal-fin membranes: The spinous dorsal-fin membranes of *A. dorsomaculatus*, *A. microstomus*, *A. diadema* and *A. ittodai* have a dark pigmented portion. *Adioryx diadema* is distinctive in having its membranes mostly black with white oblique bands (Fig. 5C), whereas the other three species have less dark pigmentation (Fig. 5A, B, D).

Key to the species of *Adioryx* from Japan
and the western Pacific
(Figs. 3~5)

A₁ Scales between lateral-line and origin of third dorsal-fin spine 3.5.

B₁ Nostril with spinules. Spinous dorsal-

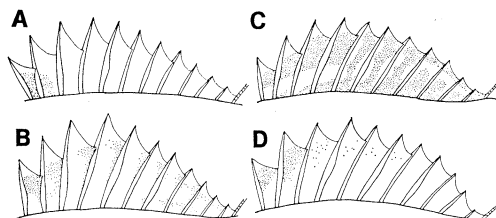


Fig. 5. Pigmentation on spinous dorsal-fin membranes in preserved condition of four species of *Adioryx*. A: *A. dorsomaculatus*, HUMZ 41396, 138.2 mm SL, Ishigaki Is., Japan. B: *A. microstomus*, HUMZ 40298, 95.8 mm SL, Papua-New Guinea. C: *A. diadema*, HUMZ 40265, 113.1 mm SL, Okinawa Is., Japan. D: *A. ittodai*, HUMZ 47942, 127.7 mm SL, Okinawa Is., Japan.

- fin membranes not incised
..... *A. furcatus*
- B₂ Nostril without spinules. Spinous dorsal-fin membranes incised
..... *A. spinifer*
- A₂ Scales between lateral-line and origin of third dorsal-fin spine 2.5.
- C₁ Nostril with one or more spinules.
- D₁ Lateral-line scales 40~43. Body, fins without dark areas
..... *A. caudimaculatus*
- D₂ Lateral-line scales 32~37. Body or fin with dark areas.
- E₁ Upper margin of first suborbital bone with serrations. Body without dark pigmented portion. Dorsal fin with a black blotch ...
..... *A. dorsomaculatus*, sp. nov.
- E₂ Upper margin of first suborbital bone smooth. Body uniformly dark or with dark areas. Dorsal fin without black blotch.
- F₁ Dorsal-fin rays 13. Upper lip projecting well beyond lower. Base of soft dorsal-, soft anal- and caudal-fins with a black blotch *A. cornutus*
- F₂ Dorsal-fin rays 14. Upper lip not projecting. Body uniformly dark *A. violaceus**

* This species is included in the key because it might be expected to occur in Japan. This key is based on two specimens from the Marshall Islands and Palau Islands. According to Munro (1967), this species has 34~37 lateral-line scales and 14 or 15 dorsal-fin rays.

- C₂ Nostril without spinules.
- G₁ Posterior portion of nasal bone with a few spinules.
- H₁ Lateral-line scales 35~38. Body deep, depth 2.5~2.7 in SL *A. spinosissimus*
- H₂ Lateral-line scales 49~56. Body shallow, depth 3.1~3.5 in SL.... *A. microstomus**
- G₂ Posterior portion of nasal bone without spinules.
- I₁ Upper margin of first suborbital bone with a spine projecting horizontally.....*A. ruber*
- I₂ Upper margin of first suborbital bone without a spine projecting horizontally.
- J₁ Lateral-line scales less than 46.
- K₁ Lateral-line scales 40 or 41. Pectoral-fin rays 13 or 14. Preopercular spine long, slightly longer than two-thirds of orbit. Body without dark pigmentation...*A. tiereoides***
- K₂ Lateral-line scales 42~45. Pectoral-fin rays 15. Preopercular spine short, about half of orbit. Body with dark dots *A. lacteoguttatus*
- J₂ Lateral-line scales more than 46.
- L₁ Preopercular spine long, subequal to orbit. Dorsal-fin spines short, the longest one reaches from snout to half of orbit. Dorsal-fin membranes without dark areas....*A. tiere*
- L₂ Preopercular spine short, less than half of orbit. Dorsal-fin spines long, the longest one exceeds from snout to posterior

* The authors could not obtain any Japanese specimens of this species, although it may have been recorded from Japan (Aoyagi, 1941). This key is based on 11 specimens from outside of Japan. After Günther (1859), this species has 47~53 lateral-line scales

** This species is included in the key because it might be expected to occur in Japan. The authors examined three specimens from Papua-New Guinea and the Solomon Islands. Munro (1967) gave counts of 38~41 lateral-line scales for *A. tiereoides*.

- margin of orbit. Dorsal-fin membranes with dark areas.
- M₁ Pectoral-fin rays 13~15 (usually 14). Spinous dorsal-fin membranes almost entirely black with oblique white bands....*A. diadema*
- M₂ Pectoral-fin rays 15 or 16 (usually 15). A black blotch on distal part of membranes between first and third dorsal-fin spines*A. ittodai*

Adioryx furcatus (Günther, 1859)

(Figs. 3A, 6)

(Japanese name: Hana-ebisu)

Holocentrum furcatum Günther, 1859: 29 (type locality, South Sea).

Holocentrus ensifer Jordan and Evermann, 1904: 176 (type locality, Honolulu); 1905: 165, pls. 28, XI.

Holocentrus furcatus; Jordan and Seale, 1906: 224.

Adioryx furcatus; Masuda, Araga and Yoshino, 1975: 197, pl. 31-J.

Diagnosis. Scales above lateral-line 3.5. Nostril with spinules. Spinous dorsal-fin membranes not incised.

Specimens examined. 18 specimens, 178.8~220.1 mm SL. HUMZ 40455, 40456, Apr. 15, 1974; 40457, Apr. 12, 1974; 40458, Apr. 30, 1974; 40459, Apr. 12, 1974; 40471, Apr. 10, 1974; 40477, Apr. 6, 1974; 41476, May 13, 1975; 47367, Apr. 5, 1974; 47398, Mar. 6, 1974; 47402, Apr. 20, 1974; 47743, Apr. 23, 1973; 47796, Apr. 17, 1973; 62838, Apr. 13, 1977; 62879, Apr. 15, 1977. KSHS 13724, 13725, Aug. 2, 1972; 14290, Jul., 1973. Localities: Okinawa Is., Ishigaki Is., Miyako Is., Okinawa Pref.; Kagoshima City, Kagoshima Pref.

Description. D. XI, 14 or 15 (usually 14), Pec. 15, A. IV, 10. Lateral-line scales 43~47 (usually 45 or 46). Scales 3.5 above, 8 or 9 (usually 8) below lateral-line. Gill rakers 6~8 (usually 7)+1+11~13 (usually 12)=18~22 (usually 19 or 20).

Head 2.8~3.2, body depth 2.5~2.8 in SL. Orbit 2.6~3.3; jaws, upper 2.2~2.4, lower 1.6~1.8; dorsal-fin spines, first 2.0~2.7,

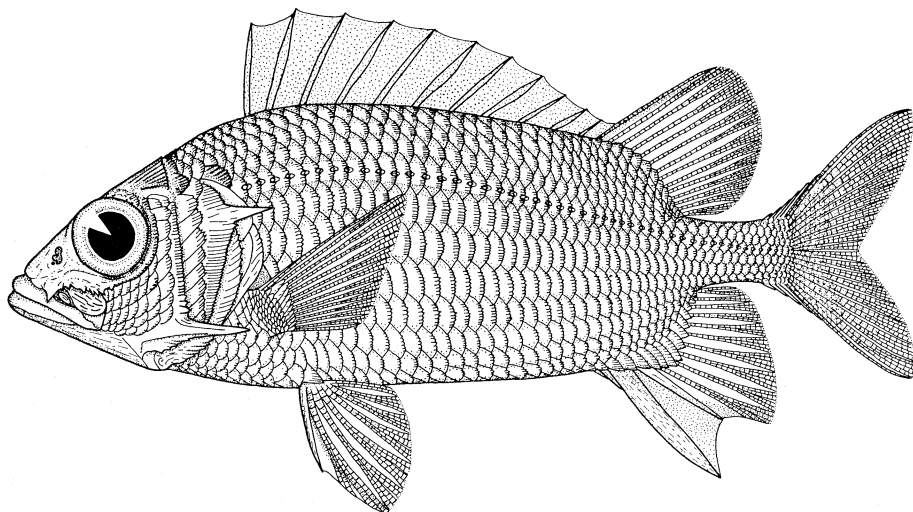


Fig. 6. *Adioryx furcatus* (Günther, 1859), HUMZ 40458, 178.8 mm SL, Ishigaki Is. Drawing by T. Shimizu.

second 2.0~2.5, third 1.9~2.5; anal-fin spines, third 1.6~1.9, fourth 2.0~2.6 in HL. Snout 1.0~1.3, interorbital 1.5~2.1 in orbit diameter.

Head profile gently curved. Spinous dorsal-fin base gently curved. Soft dorsal-fin base not raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril small, usually with spinules on both margins (spinules on posterior margin sometimes absent). Lateral margin of frontal bone concave, not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone smooth. Lips thick. Lower jaw slightly protruding when mouth closed. Opercle with a stout, long spine. Preopercular spine long, about two-thirds of orbit diameter. Dorsal-fin spines high, the first and second very long, slightly shorter than the third and fourth. Spinous dorsal-fin membranes not incised. Third anal-fin spine stout, rather short. Body scales well striated and serrated.

Color when fresh: Ground color of head and body red. Each longitudinal body scale row with a stripe, yellow above lateral-line, white below. Spinous dorsal-fin membranes and dorsal-fin spines red or yellowish red. Pectoral-fin red. Inner face of pectoral-fin axil red. Anterior edge of soft dorsal-fin white, a red region immediately behind the edge, the rest of fin reddish. Anterior margin

of pelvic-fin white, red just behind this, the rest of fin reddish. First to third anal-fin spines white, spinous anal-fin membranes and tips of first to third anal-fin rays red, the rest of fin reddish. Upper and lower margins of caudal-fin lobes white, outer two caudal-fin rays red, the remaining fin rays white.

Synonymy. The authors concur with Fowler (1928) that *Holocentrus ensifer* Jordan et Evermann, 1904 is a junior synonym of *H. furcatus*. The characters of one opercular spine, nostril spinules and 3.5 scales above the lateral-line given in the description of this species plus the excellent figure (Jordan and Evermann, 1905) leave no doubt of the conspecificity of *H. ensifer* and *A. furcatus*.

Adioryx spinifer (Forsskål, 1775)

(Fig. 7)

(Japanese name: Togari-ebisu)

Sciaena spinifera Forsskål, 1775: 49 (type locality, Djedda, Arabia).

Perca spinifera; Bloch and Schneider, 1801: 86.
Holocentrum spinifer; Rüppell, 1828 (not fig. 23-1).

Holocentrus leo Cuvier, 1829: 204 (type locality, Borabora, Solomon Islands).

Holocentrum binotatum Quoy and Gaimard, 1834: 679, pl. 14, fig. 4 (type locality, Guam Is.).

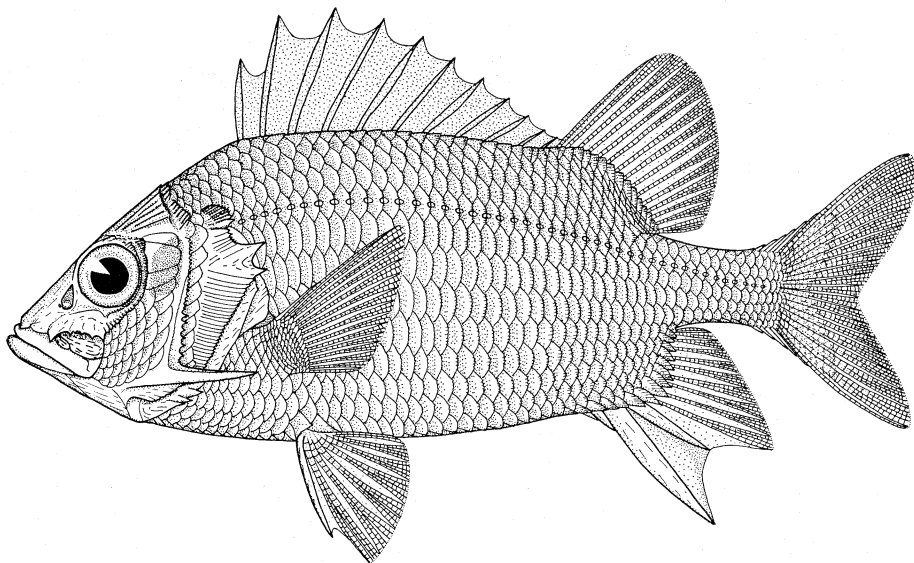


Fig. 7. *Adioryx spinifer* (Forsskål, 1775), HUMZ 40481, 219.0 mm SL, Okinawa Is. Drawing by T. Shimizu.

Holocentrum spiniferum; Bleeker, 1853a: 34.
Holocentrum unipunctatum Günther, 1874: 95;
 1875, fig. 65-A (type locality, Solomon and
 Tonga Islands).
Holocentrus leo; Smith and Swain, 1882: 125.
Holocentrus binotatum; Bryan and Herre, 1903:
 128.
Holocenthrus (Sargocentron) leo; Fowler, 1904b:
 235.
Holocentrus bowiei Jordan and Snyder, 1905:
 353, fig. 1 (type locality, Tahiti, Society
 Islands).
Holocentrus verticalis Seale, 1906: 22, fig. 6
 (type locality, Tahiti).
Holocentrus spiniferus; Aoyagi, 1941: 470, fig. 1.
Sargocentron spinifer; Fowler, 1944: 188.
Adioryx spinifer; Axelrod and Emmens, 1969:
 164, with fig. (not numbered).

Diagnosis. Scales above lateral-line 3.5. Nostril without spinules. Spinous dorsal-fin membranes well incised. Preopercular spine very long, exceeding orbit diameter.

Specimens examined. 19 specimens, 175.0~266.2 mm SL. HUMZ 39160, Aug. 15, 1974; 40479, Apr. 4, 1974; 40480, Apr. 8, 1974; 40481, Apr. 4, 1974; 40492, Apr. 4, 1974; 40493, Apr. 22, 1974; 47360, Mar. 18, 1974; 47395, Mar. 9, 1974; 47401, Mar. 14, 1974; 47664, Apr. 15, 1973; 47638, Apr. 17, 1973; 47692, Apr. 16, 1973; 47741, Apr. 16, 1973;

47771, Apr. 26, 1973; 62725, Apr. 5, 1977. KSHS 4961, Aug., 1964; 5484, Aug., 1966; 13726, Aug. 2, 1972; 14392, Jul., 1973. Localities: Okinawa Is., Ishigaki Is., Miyako Is., Okinawa Pref.; Amami-oshima, Kagoshima Pref.

Description. D. XI, 14~16 (usually 15), Pec. 15, A. IV, 9 or 10 (usually 10). Lateral-line scales 41~47 (usually 43~45). Scales 3.5 above, 9 or 10 (usually 9) below lateral-line. Gill rakers 5~7 (usually 6)+1+10~12=17~20 (usually 19).

Head 2.9~3.1, body depth 2.5~2.6 in SL. Orbit 3.5~4.8; jaws, upper 2.4~2.7, lower 1.7~2.0; dorsal-fin spines, first 2.5~3.4, second 1.7~2.4, third 1.7~2.3; anal-fin spines, third 1.5~2.2, fourth 2.1~2.7 in HL. Snout 0.6~0.9, interorbital 1.6~2.4 in orbit diameter.

Body much compressed. Head profile straight. Spinous dorsal-fin base straight. Soft dorsal-fin base slightly raised. Anterior tip of nasal bone truncate, with a blunt spine. Posterior portion of nasal bone smooth. Nostril large, without spinule. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Eye small, less than the snout. Interorbital concave. Upper margin of first suborbital bone smooth. Lips thick. Lower jaw protruding when mouth closed. Opercle with two blunt spines, the upper slightly

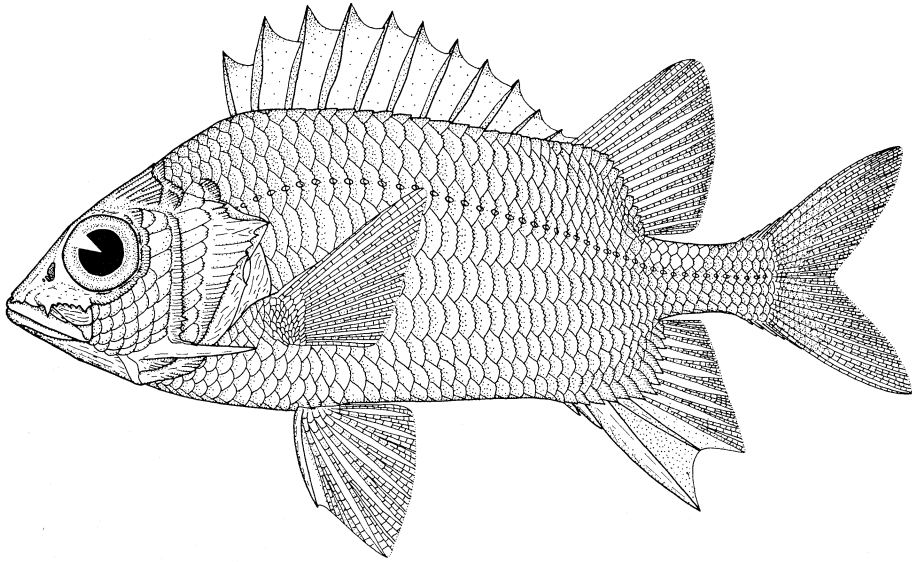


Fig. 8. *Adioryx caudimaculatus* (Rüppell, 1835), HUMZ 41401, 155.5 mm SL, Ishigaki Is. Drawing by T. Shimizu.

longer. Preopercular spine very long, slightly longer than the orbit. Dorsal-fin spines very high. Spinous dorsal-fin membranes incised. Third anal-fin spine long and stout. Body scales slightly striated and serrated.

Color when fresh: Head and body red, darker dorsally, paler ventrally. Posterior margin of body scales whitish. A large crimson patch on temple. Spinous dorsal-fin and inner face of pectoral-fin axil crimson. Soft dorsal-, pectoral-, pelvic-, soft anal- and caudal-fins yellow. Pelvic-fin spine and third anal-fin spine white.

Synonymy. *Holocentrus leo* Cuvier, 1829 and *Holocentrus binotatum* Quoy et Gaimard, 1834 have been synonymized with *Holocentrus spinifer* by many authors without referring to any typological evidence. Bauchot (1970) synonymized them with *Holocentrus (Sargocentron) spinifer* based on the examination of the holotype. Woods (1955), as a result of his careful study of several large series of specimens and comparisons with the figures of Rüppell (1835), Günther (1875), and Quoy and Gaimard (1834), revealed that *H. binotatus* and *Holocentrus unipunctatum* Günther, 1874 are junior synonyms of *A. spinifer*.

Holocentrus bowiei Jordan et Snyder, 1905 has 3.5 scales above the lateral-line, the nostril

lacks spination, and the meristic characters agree well with those of *A. spinifer* examined in this study except for 11 anal-fin rays. Although Fowler (1928) synonymized *H. bowiei* with *H. caudimaculatus*, it is a junior synonym of *A. spinifer*.

Some specimens of *Holocentrus verticalis* Seale, 1906 were synonymized with *H. spinifer* by Fowler (1928) without any comment. Judging from the figure of the holotype of *H. verticalis* (BPBM 1394), it has 3.5 scales above lateral-line, and the nostril is without spination. The holotype of *H. verticalis* is *A. spinifer* (checked by Dr. J. E. Randall of B.P. Bishop Museum).

Onomatology. The feminine *spinifera* should be changed into masculine *spinifer*. The specific trivial of *spiniferous* (Aoyagi, 1941; Smith, 1958; Klausewitz and Nielsen, 1965) is incorrect.

Adioryx caudimaculatus (Rüppell, 1835)
(Figs. 4B, 8)

(New Japanese name: Kurakake-ebisu)

Holocentrus spinifer; Rüppell, 1828, fig. 23-1 (type locality, Red Sea).

Holocentrus ruber; Bennett, 1828: 4, figure only (not numbered).

Holocentrum spiniferum; Cuvier, 1829: 206.
Holocentrus caudimaculatus Rüppell, 1835: 97.
Holocentrum leonoides Bleeker, 1849: 71.
Holocentrum caudimaculatum; Günther, 1859: 41.

Holocentrum andamanense Day, 1870: 686 (type locality, Port Blair, Andaman Islands).

Holocentrus rubellio Seale, 1906: 22, fig. 5 (type locality, Tahiti).

Holocentrus caudimaculatus; Seale and Bean, 1907: 241.

Holocentrus andamanensis; Smith, 1953: 515, fig. 297b.

Adioryx caudimaculatus; Axelrod and Emmens, 1969: 158, with fig. (not numbered).

Diagnosis. Nostril with one or two spinules on anterior margin, rarely another spinule on posterior margin. Upper margin of first suborbital bone without serrations. Dorsal-fin rays 14.

Specimens examined. 25 specimens, 99.7~193.4 mm SL. HUMZ 40474, Apr. 16, 1974; 41331, Apr. 29, 1975; 41397, May 2, 1975; 41399~41401, May 2, 1975; 41418~41423, May 3, 1975; 41464, May 7, 1975; 62881~62883, Apr. 16, 1977; 63038, 63039, Apr. 27, 1977. KSHS 5716, Aug., 1966; 6563, 1967; 12089, 12138, Jul. 21~Aug. 7, 1971; 14258, Jul. 31, 1973; 16966, 16968, Nov. 4, 1975. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.; Amami-oshima, Kagoshima Pref.

Description. D. XI, 14, Pec. 13 or 14 (only one 13), A. IV, 9. Lateral-line scales 40~43 (usually 41 or 42). Scales 2.5 above, 8 below lateral-line. Gill rakers 5~8 (usually 6 or 7)+1+10~12 (usually 11 or 12)=16~21 (usually 19 or 20).

Head 2.8~3.1, body depth 2.4~2.9 in SL. Orbit 2.8~3.3; jaws, upper 2.4~2.8, lower 1.8~2.0; dorsal-fin spines, first 3.0~4.3, second 2.2~2.7, third 1.8~2.4; anal-fin spines, third 1.4~1.6, fourth 1.9~2.3 in HL. Snout 0.9~1.3, interorbital 1.4~1.8 in orbit diameter.

Head profile straight. Spinous dorsal-fin base straight. Soft dorsal-fin base not raised. Anterior tip of nasal bone with two distinct divergent spines. Posterior portion of nasal bone without spination. Nostril usually with one, sometimes two spinules on its anterior margin (of 25 specimens examined, one lacks a spinule on its anterior margin of right

nostril, and another has a spinule on posterior margin of right nostril). Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone without serrations. Lower jaw not protruding when mouth closed. Opercle with three or four stout, short spines, the lowermost shortest. Preopercular spine long, about equal to orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes incised. Third anal-fin spine stout. Body scales serrated, not striated.

Color when fresh: Ground color red, darker anteriorly and dorsally, lighter posteriorly and ventrally. Posterior margin of body scales white or silver. A silvery spot on caudal peduncle just behind soft dorsal-fin. Dorsal-fin spines red. Spinous dorsal-fin membranes white, with a triangular red spot just behind tip of each dorsal-fin spine. Anterior two dorsal-fin rays, first pelvic-fin ray, spinous anal-fin membranes, and anterior margin of caudal-fin lobes red. Remaining fin rays light red. Anterior edge of pelvic-fin and third anal-fin spine whitish.

When alive, body red on anterior half and silvery on posterior half (personal communication from Mr. T. Yoshino).

Synonymy. *Holocentrum andamanense* Day, 1870 had been synonymized with *H. spinifer* by some authors (Weber and de Beaufort, 1929; Montilla, 1938; Yu, 1963). According to Day's description (1870: 686; 1875: 172, pl. 41, fig. 3) this species closely resembles *A. caudimaculatus* in general body form, the number of scales above the lateral-line and lateral-line scales, and the nostril spination, though differing in having 17 pectoral-fin rays. But the holotype and another specimens (No. 1003 and 1002, respectively, Indian Museum) have 14 pectoral-fin rays as in *A. caudimaculatus* (courtesy of Dr. P. K. Talwar of the Indian Museum). Thus *H. andamanense* is evidently not the junior synonym of *A. spinifer* but that of *A. caudimaculatus*.

Holocentrum leonoides Bleeker, 1849 was properly synonymized with *H. caudimaculatus* by Bleeker (1873b).

Holocentrus rubellio Seale, 1906 was placed in synonymy with *H. caudimaculatus* Rüppell, 1835 by Fowler (1928). Re-examination of

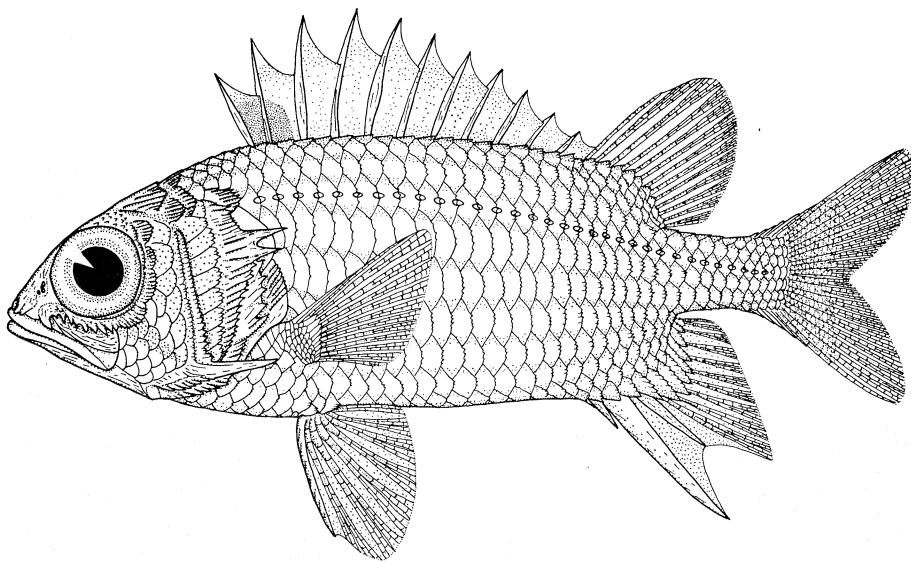


Fig. 9. *Adioryx dorsomaculatus* Shimizu et Yamakawa, sp. nov., holotype, HUMZ 41396, 138.2 mm SL, Ishigaki Is. Drawing by T. Shimizu.

the holotype of *H. rubellio* (BPBM 1395) reveals that it has one spinule on the anterior margin of the right nostril, 14 dorsal-fin rays and 2.5 scales above the lateral-line (courtesy of Mr. A. Y. Suzumoto of B.P. Bishop Museum). These characters are diagnostic for *A. caudimaculatus*.

Remarks. There has been confusion in Japan over the identification and the Japanese name of this species. Kamohara (1964) reported *Holocentrus andermanensis* (misprinting of *andamanensis*) from Okinawa Island and gave it the Japanese name "minami-ebisu." The authors' re-examination of Kamohara's specimens (BSKU 10240, 10392, from Okinawa Is., Nov., 1961) reveals that he erroneously identified *A. furcatus* as *H. andamanensis*. Masuda, Araga and Yoshino (1975) misidentified *A. caudimaculatus* as *A. andamanensis*; they also used the name "minami-ebisu." Zama and Fujita (1977) reported *A. caudimaculatus* from Ogasawara Islands and called it "minami-ebisu." The Japanese name "minami-ebisu", however, was first given to a shark, *Notorhynchus pectorosus* (Garman, 1884) by Teng (1962). A new Japanese name, "kurakake-ebisu" is proposed for *A. caudimaculatus*.

Adioryx dorsomaculatus, sp. nov.

(Figs. 3C, 4A, 5A, 9)

(New Japanese name: Bara-ebisu)

Type locality. Ishigaki Is., Ryukyu Islands, Japan.

Diagnosis. Nostril with spinules. Lateral-line scales 32~35. First suborbital bone with a spine and serration on its upper margin. A black blotch on proximal part between first and third dorsal-fin spines.

Specimens examined. Eight specimens, 138.2~196.6 mm SL. BMNH 1979.5.24.1, 168.9 mm SL, Apr. 25, 1973, off mouth of Kabira Bay, Ishigaki Is., Okinawa Pref., gill net, by T. Shimizu. BSKU 50001, 153.8 mm SL, Mar. 21, 1974, Naha Fish Market, Okinawa Pref.; 50002, 186.3 mm SL, Oct. 27, 1975, Naha Fish Market, both by T. Yamakawa. HUMZ 40256, 156.0 mm SL, Apr. 27, 1974, Arakawa, Ishigaki Is., gill net, by T. Shimizu; 41396, 138.2 mm SL, May 2, 1974, Arakawa, Ishigaki Is., gill net, by K. Matsuura; 62846, 196.6 mm SL, Apr. 13, 1977, Yonagusuku Fish Market, Okinawa Is., Okinawa Pref., by T. Shimizu. USNM 219673, 168.1 mm SL, 1967, Koniya, Amami-oshima, Kagoshima Pref.; by T. Yamakawa. ZUMT 54050, 171.7 mm SL, Aug. 4, 1976, Kakeroma Is., Amami Islands, Kagoshima Pref., angling, by W. Takada.

Holotype: HUMZ 41396. Paratypes: BMNH 1979.5.24.1; BSKU 50001, 50002; HUMZ 40256, 62846; USNM 219673; ZUMT 54050.

Description. Counts and proportional ratios of the holotype are presented first, followed by those of the seven paratypes in parentheses. D. XI, 13 (XI, 13), Pec. 13 (13 or 14, usually 14), Pelv. I, 7 (I, 7), A. IV, 9 (IV, 9), C. 5+1+1+9+8+1+1+4 (5+1+1+9+8+1+1+4). Lateral-line scales 33 (32~35, usually 33). Scales 2.5 (2.5) above, 7 (7 or 8) below lateral-line. Gill rakers 5 (5~7)+1 (1)+9 (9~11)=15 (16~18). Branchiostegals 8 (8). Vertebrae 11+16=27 (11+16=27).

Head 2.8 (2.7~3.0), body depth 2.7 (2.4~2.8) in SL. Orbit 2.8 (2.9~3.4); jaws, upper 2.2 (2.2~2.3), lower 1.8 (1.8~2.0); dorsal-fin spines, first 3.1 (2.6~3.5), second 2.5 (2.1~2.5), third 2.2 (1.9~2.3); anal-fin spines, third 1.6 (1.6~1.7), fourth 2.5 (2.1~2.7) in HL. Snout 1.4 (1.1~1.5), interorbital 1.6 (1.4~1.6) in orbit diameter.

Snout profile steep, nape gently curved. Spinous dorsal-fin base gently curved. Soft dorsal-fin base not raised. Anterior tip of nasal bone with two blunt spines. Posterior portion of nasal bone without spination. Nasal fossa wide, "U"-shaped. Nostril narrow, with two pungent spinules on posterior margin. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital wide, concave. Upper margin of first suborbital bone with a stout spine and following serrae. Suborbital bones rather large, with coarse serrations. Lower jaw not protruding when mouth closed. Posterior end of upper jaw below posterior margin of pupil. Two foraminae in under side of lower jaw, anterior minute one in lip, posterior large one in boundary of lip and bony area. Opercle with two stout, pungent spines; the upper slightly longer. Preopercular spine long, slightly longer than two-thirds of orbit. Opercular bones and head bones with coarse serrations. Dorsal-fin spines stout, high; fourth the longest. Soft dorsal-fin rounded. Spinous dorsal-fin membranes well incised. Pectoral-fin small, rather triangular. Pelvic-fin round. Third anal-fin spine stout, sharp. Tip of caudal lobes round. Body scales with sharp

serrations, almost not striated. Pectoral-fin axil, head, jaws, and soft dorsal- and anal-fins scaleless. Pectoral-fin base with small scales, those on fin ray origin elongate. Pelvic-fin axil scales elongate. Small scales forming a sheath along base of soft dorsal-fin. Enlarged scales forming a sheath along base of soft anal-fin. Squamation on caudal lobes. Cheek with four scale rows. Scales above lateral-line to origin of first dorsal spine and to origin of third spine 2.5.

Color when fresh: A black blotch on proximal part of dorsal-fin membranes between first and third spines. Ground color of head and body red. Each longitudinal body scale row with a wide, pale red stripe. Dorsal-fin spines red. Spinous dorsal-fin membranes pale red; a small, triangular, white spot just behind tip of each dorsal-fin spine. Pupil black, eye with black anterior margin. Soft dorsal-, pectoral-, pelvic-, soft anal- and caudal-fins red. Third anal-fin spine whitish. In alcohol: Body uniformly yellow, with black blotch on proximal part between first and third dorsal-fin spines.

Discussion. The present species is characterized by its fewer lateral-line scales (32~35), presence of serration on the upper margin of the first suborbital bone and presence of spinules on the nostril.

The number of lateral-line scales is compared with that of the 13 species examined in this study. These are cited below in parentheses. *A. furcatus* (43~47). *A. spinifer* (41~47). *A. caudimaculatus* (40~43). *A. cornutus* (32~36). *A. violaceus* (34~37, by this study and Munro, 1967). *A. spinosissimus* (35~38). *A. microstomus* (47~56, by this study and Günther, 1859). *A. ruber* (34~37). *A. tiereoides* (38~41, by this study and Munro, 1967). *A. lacteoguttatus* (42~45). *A. tiere* (47~52). *A. diadema* (46~50). *A. ittodai* (46~49). Moreover, the number of lateral-line scales of the following nine species, which may have taxonomic validity, are cited below for comparison (counts in parentheses are from the literature). *Holocentrum hastatum* Cuvier, 1829: 208, pl. 59 (about 42, counted from pl. 59). *H. melanopterus* Bleeker, 1855: 302 (43). *H. macropus* Günther, 1859: 31 (52). *H. suborbitale* Gill, 1864: 86 and Herre, 1936:

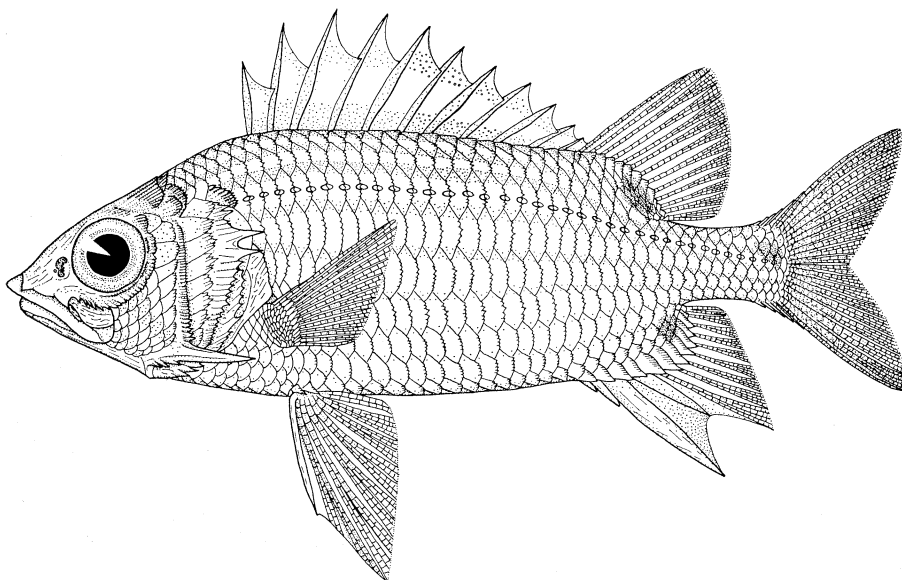


Fig. 10. *Adioryx cornutus* (Bleeker, 1853), HUMZ 40508, 179.0 mm SL, Ishigaki Is. Drawing by T. Shimizu.

60 (35~36). *H. wilhelmi* De Buen, 1963: 25 (46~48). *Holocentrus xantherythus* Jordan and Evermann, 1904: 175 (47). *H. xanthurus* Fowler, 1944: 166, fig. 5 (41). *H. seychellensis* Smith, 1963: 33; Smith and Smith, 1963: 9 (38~40).

The number of lateral-line scales (32~35) of the present species partially corresponds with counts for *A. cornutus* (32~36), *A. violaceus* (34~37), *A. spinosissimus* (35~38), *A. ruber* (34~37) and *H. suborbitale* (35~36). The present species is clearly separable from *A. cornutus* and *A. violaceus* by the presence of serrations on the upper margin of the first suborbital bone and general body coloration, from *A. spinosissimus* by lacking spination on the posterior portion of the nasal bone and the presence of nostril spinules, and from *A. ruber* by the presence of nostril spinules.

No specimens of *H. suborbitale* were examined in this study. This species is reported to have 35~36 lateral-line scales and dark dots on the body and fins (Gill, 1864; Herre, 1936). The present species has 32~35 lateral-line scales and no dark dots on the body. Moreover, *H. suborbitale* is known only from the eastern Pacific, which shares very few fish species with the western Pacific. Thus the present species is evidently undescribed.

Etymology. Named *dorsomaculatus* referring to the black blotch on dorsal fin membranes between the first and third spines.

Remarks. One specimen (ZUMT 54050) collected in August has fully ripe eggs, thus this species may be a summer-spawner.

Two pungent spinules on the posterior margin of the nostril are always present. One specimen (BMNH 1979.5.24.1) has a spine on the anterior margin of the right nostril in addition to the two on the posterior margin.

One specimen (HUMZ 40256) does not have the distinct spinous dorsal-fin maculation. However, all other characters agree well with those of other specimens. This specimen may represent an individual variation.

Adioryx cornutus (Bleeker, 1853)

(Figs. 3D, 10)

(Japanese name: Sumitsuki-kanoko)

Holocentrum cornutum Bleeker, 1853b: 240 (type locality, Seram, Indonesia).

Holocentrum melanospilos Bleeker, 1858a: 2 (type locality, Amboina, Indonesia).

Holocentrus cornutus; Bleeker, 1863: 146.

Holocentrum melanospilus; Bleeker, 1873b: 226.

Adioryx cornutus; Masuda, Araga and Yoshino, 1975: 196, pl. 31-C.

Diagnosis. Nostril with two or more spinules on posterior margin, rarely, in addition a spinule on anterior margin. Upper margin of first suborbital bone smooth. Dorsal-fin rays 13. Black blotch on base of soft dorsal-, soft anal-, and caudal-fins.

Specimens examined. 27 specimens, 115.2~197.0 mm SL. HUMZ 40470, Apr. 20, 1974; 40506, Apr. 17, 1974; 40508, 40509, Apr. 17, 1974; 47730, May 10, 1974; 47738, Apr. 15, 1973; 47746, Apr. 28, 1974; 47774, Apr. 16, 1973; 48847, Apr. 22, 1973; 62885, Apr. 16, 1977. KSHS 6534, Aug. 7, 1967; 6985, Aug. 5, 1968; 8663, Jul., 1968; 8686, 8687, Oct., 1968; 11618, Nov., 1970; 11650, 11661~11663, Apr., 1971; 11702, 11703, May 1971; 12088, Jul. 21~Aug. 7, 1971; 13505, Mar., 1972; 14394, Jul., 1973; 15196, 15235, Mar. 21~25, 1974. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.; Amami-oshima, Kagoshima Pref.

Description. D. XI, 13, Pec. 13 or 14 (usually 14), A. IV, 9. Lateral-line scales 32~36 (usually 34 or 35). Scales 2.5 above, 7 or 8 below lateral-line. Gill rakers 4~7+1+9~11=14~19 (usually 17 or 18).

Head 2.8~3.1, body depth 2.6~3.0 in SL. Orbit 2.7~3.4; jaws, upper 2.0~2.2, lower 1.7~1.8; dorsal-fin spines, first 2.8~3.8, second 2.0~2.5, third 1.8~2.3; anal-fin spines, third 1.5~1.8, fourth 2.0~2.5 in HL. Snout 1.0~1.3, interorbital 1.3~1.5 in orbit diameter.

Body rather elongate. Head profile slightly curved. Spinous dorsal-fin base straight. Soft dorsal-fin base not raised. Anterior tip of nasal bone ending in a blunt spine. Posterior portion of nasal bone smooth. Posterior margin of nostril with two or more pungent spinules (of 27 specimens examined, only one has a spinule on anterior margin of nostril). Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital convex. Upper margin of first suborbital bone smooth. Upper lip much protruding beyond the lower. Opercle with two sharp spines, the upper slightly longer. Preopercular spine long, slightly shorter than the orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes well incised. Anterior rays of pelvic-fin elongate. Third anal-fin spine

stout, rather short. Cheek with six scale rows. Body scales finely serrated, almost not striated.

Color when fresh: Posterior base of soft dorsal- and anal-fins and base of caudal-fin with a black blotch. Head and dorsal portion of body red, ventral portion paler red. Each longitudinal body scale row with a yellow stripe, darker dorsally, paler ventrally. Dorsal-fin spines red. Spinous dorsal-fin membranes pale red, with a small triangular white spot just behind tip of each dorsal-fin spine and a faint and wide longitudinal white band, obscure anteriorly, distinct posteriorly. Anterior edge of soft dorsal-fin red, the rest of fin yellow. Pectoral-fin yellow, the axil black. Anterior edge of pelvic-fin white, first pelvic ray red, the rest of fin yellow. Third anal-fin spine whitish, spinous anal-fin membranes deep red or dusky, the rest of fin yellow. Anterior edge of both caudal-fin lobes red, the rest of fin yellow.

Synonymy. Although Bleeker (1873b) distinguished *Holocentrus melanospilos* Bleeker, 1858 and *H. cornutum* Bleeker, 1853, Weber and de Beaufort (1929) synonymized the two and gave a detailed explanation.

Remarks. One specimen (HUMZ 48847, 196.3 mm SL) has about a pupil-size black patch at the base of the first dorsal-fin spine on the left side, but no other special differences in coloration or morphology were noted. This is considered to be an example of partial melanosis.

Adioryx violaceus (Bleeker, 1853)

(Figs. 3E, 4B, 11)

(New Japanese name: Sumire-ebisu)

Holocentrum violaceum Bleeker, 1853c: 355 (type locality, Amboina).

Holocentrus violaceus; Jordan and Seale, 1906: 223.

Adioryx violaceus; Burgess and Axelrod, 1975: 1454, figs. 114, 115.

Diagnosis. Nostril with spinules, Upper margin of first suborbital bone smooth. Dorsal-fin rays 14. Body scales uniformly dark or violet with white posterior margin.

Specimens examined. Two specimens, 108.2 and 118.1 mm SL. HUMZ 69942 and ZUMT

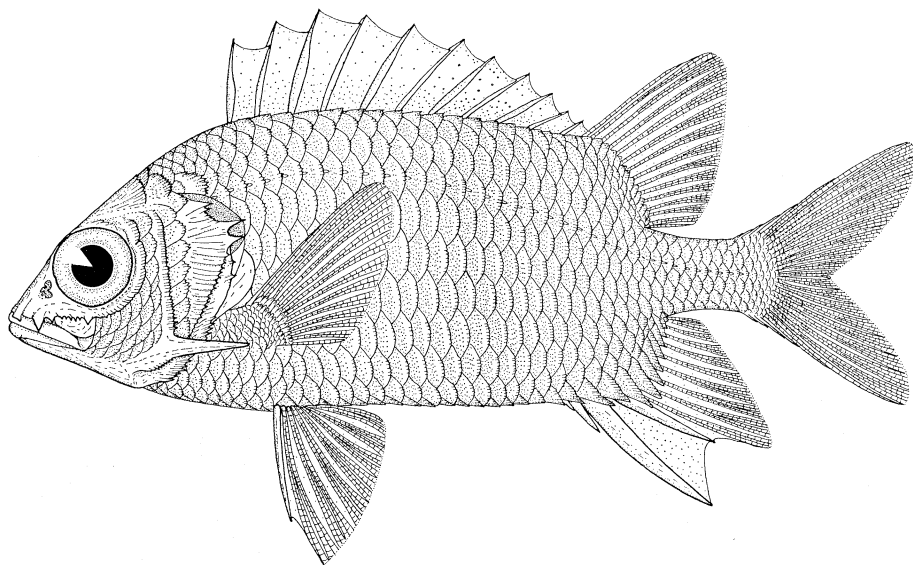


Fig. 11. *Adioryx violaceus* (Bleeker, 1853), ZUMT 54055, 118.1 mm SL, Palau Islands. Drawing by T. Shimizu.

54055, date unknown. Localities: Marshall Islands and Palau Islands.

Description. D. XI, 14, Pec. 14, A. IV, 9. Lateral-line scales 35 or 37. Scales 2.5 above, 8 below lateral-line. Gill rakers 6 or 7+1+11 or 12=18 or 20.

Head 2.7 or 3.0, body depth 2.3 or 2.6 in SL. Orbit 2.9 or 3.0; jaws, upper 2.5, lower 1.8; dorsal-fin spines, first 2.8 or 4.1, second 2.4 or 3.2, third 2.4 or 2.8; anal-fin spines, third 1.6 or 1.7, fourth 2.1 or 2.2 in HL. Snout 1.2 or 1.3, interorbital 1.7 or 1.8 in orbit diameter.

Head profile almost straight. Spinous dorsal-fin base slightly curved. Soft dorsal-fin base slightly raised. Anterior tip of nasal bone with two divergent spines. Posterior portion of nasal bone smooth. Both margins of nostril with spinules, one specimen (ZUMT 54055) lacks the spinule on posterior margin of right nostril. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone smooth. Lower jaw not protruding when mouth closed. Opercle with two blunt spines, the upper slightly longer. Preopercular spine long, slightly shorter than the orbit. Dorsal-fin spines moderate in height, first and second long, both little shorter than the third and fourth. Third

anal-fin spine rather slender. Cheek with four scale rows. Body scales well serrated, almost not striated.

Color when alive (based on underwater photograph taken by Mr. H. Masuda from Palau Islands): Head dark red, body scales violet with white or silvery posterior margin, spinous dorsal- and anal-fin membranes dark red, anterior margin of soft dorsal-fin and both caudal-fin lobes red, other soft fin rays pale red. Opercular flap black, pectoral axil red. In formalin, body scales dark with whitish posterior margin, opercular flap black.

Remarks. Although this species is not recorded from Japan, it is not improbable that this species may be found by further studies of ichthyofauna of southern Japan. Therefore, this species is described based on the two specimens from the Marshall Islands and Palau Islands, and a new Japanese name is proposed.

Adioryx spinosissimus (Temminck
et Schlegel, 1843)
(Figs. 4C, 12)

(Japanese name: Ittodai)

Holocentrum spinosissimus Temminck and
Schlegel, 1843: 22, fig. 8-A, in Siebold's
"Fauna Japonica" (type locality, Japan).

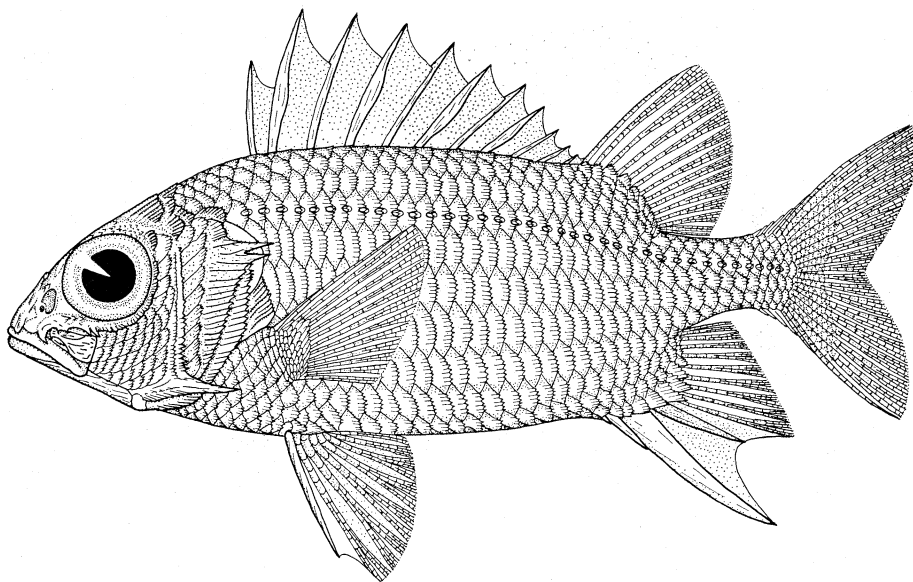


Fig. 12. *Adioryx spinosissimus* (Temminck et Schlegel, 1843), KSHS 16585, 153.9 mm SL, Okinawa Is. Drawing by T. Shimizu.

Holocentrus spinosissimus; Jordan and Fowler, 1903: 13, fig. 3.

Adioryx spinosissimus; Masuda, Araga and Yoshino, 1975: 195, pl. 31-A.

Diagnosis. Posterior portion of nasal bone with a few spinules. Lateral-line scales 35~38.

Specimens examined. Nine specimens. 142.7~168.9 mm SL. HUMZ 3465, 3466, 40798, 47715, 47816, all date unknown. KSHS 14275, 14276, Jul., 1973; 16585, 16586, Oct. 27, 1975. Localities: Shima, Mie Pref.; off Shirahama Town, Wakayama Pref.; Goto Islands, Nagasaki Pref.; Kagoshima City, Kagoshima Pref.; Okinawa Is., Okinawa Pref.

Description. D. XI, 13, Pec. 13~15 (usually 14), A. IV, 8~9 (usually 9). Lateral-line scales 35~38. Scales 2.5 above, 7~8 below lateral-line. Gill rakers 5~8+1+9 or 10=15~19.

Head 2.8~3.0, body depth 2.5~2.7 in SL. Orbit 2.2~2.7; jaws, upper 2.3~2.7, lower 1.9~2.1; dorsal-fin spines, first 2.5~3.3, second 1.8~2.2, third 1.7~2.0; anal-fin spines, third 1.4~1.7, fourth 2.2~2.7 in HL. Snout 1.4~1.8, interorbital 1.6~1.9 in orbit diameter.

Head profile gently curved. Spinous dorsal-fin base straight. Soft dorsal-fin base slightly raised. Anterior tip of nasal bone round.

Posterior portion of nasal bone with a few spinules. Nostril large, without any spination. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone with serrations. Lower jaw not protruding when mouth closed. Opercle with two sharp spines, almost equal in length. Preopercular spine moderate, about a half of orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes well incised. Third anal-fin spine long and stout. Body scales strongly ctenoid, heavily striated and finely serrated on their posterior margin.

Color when fresh: Ground color of head and body scarlet. Each longitudinal body scale row with a white stripe. Cheek to upper jaw with a wide white band. Preopercle white. Dorsal-fin spines whitish. Spinous dorsal-fin membranes red. Anterior margin of pelvic- and anal-fins white. Other fin rays red.

Synonymy. Yu (1963) expressed doubt on the distinction between *A. spinosissimus* and *A. ruber*. Re-examination of the lectotype (RMNH D 232, stuffed) and three paralectotypes (RMNH D 233, stuffed; RMNH D 386, 2 specimens in spirits) of *A. spinosissimus* indicates that this species has spinules on the

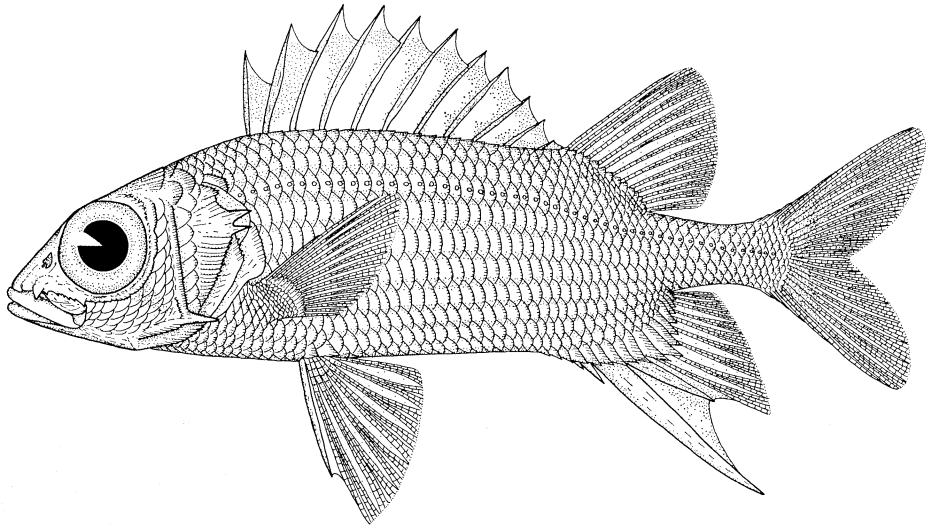


Fig. 13. *Adioryx microstomus* (Günther, 1859), BPBM 6035, 117.9 mm SL, Tahiti. Drawing by T. Shimizu.

posterior portion of the nasal bone as shown in Fig. 4C (courtesy of Dr. M. Boeseman of Rijksmuseum van Natuurlijke Historie). Also, these spinules are well illustrated in the original figure (Temminck and Schlegel, 1843). On the other hand, the posterior portion of the nasal bone in *A. ruber* is quite smooth without any spination (Fig. 4E). Therefore, both are regarded as distinct species.

Remarks. This species may be endemic to the waters of Japan and Taiwan, for there are no records from outside these localities.

There are two opinions on the date of publication of Siebold's "Fauna Japonica." Here we followed Sherborn and Jentink (1895).

Adioryx microstomus (Günther, 1859)

(Figs. 4D, 5B, 13)

(Japanese name: Hime-ebisu)

Holocentrum argenteum; Bleeker, 1858b: 1 (not Valenciennes), (type locality, Amboina).

Holocentrum microstoma Günther, 1859: 34 (type locality, Amboina).

Holocentrus microstomus; Fowler, 1902: 325.

Holocentrus microstoma; Seale, 1902: 70.

Holocentrus bleekeri Weber, 1913: 181 (type locality, Banda and Karkaralong Island).

Adioryx microstomus; Axelrod and Emmens, 1969: 162, with fig. (not numbered).

Diagnosis. Nasal bone with one or two

spinules on its postero-medial margin. Lateral-line scales 49~56.

Specimens examined. 11 specimens, 95.8~135.0 mm SL. HUMZ 40298, Oct. 10~12, 1972, north shore of Kiriwina Is., Papua-New Guinea. BPBM 6035 (6 specimens), Sep. 4, 1967, Papara, Tahiti; 18191 (3 specimens), Mar. 22, 1975, Villingili Is., Maldive Islands. One of the syntypes of *Holocentrum bleekeri*, ZMA 115.176, 135.0 mm SL, Nov. 22~Dec. 1, 1899, Siboga Expeditie St. 240, Banda-Archipelago, Indonesia.

Description. D. XI, 13 or 14, Pec. 14 or 15 (usually 15), A. IV, 9. Lateral-line scales 49~56. Scales 2.5 above, 9 below lateral-line. Gill rakers 5 or 6+1+11~13 (usually 12)=17~20.

Head 3.0~3.4, body depth 3.1~3.5 in SL. Orbit 2.5~2.7; jaws, upper 2.7~2.9, lower 1.9~2.1; dorsal-fin spines, first 2.4~3.3, second 1.8~2.3, third 1.7~1.9, fourth 1.5~1.8; anal-fin spines, third 1.1~1.2, fourth 1.7~2.0 in HL. Snout 1.3~1.6, interorbital 1.5~2.0 in orbit diameter.

Body elongate. Head profile gently curved. Spinous dorsal-fin base gently curved. Soft dorsal-fin base slightly raised and soft anal-fin base much raised. Anterior tip of nasal bone round. One or two spinules on the postero-medial margin of nasal bone. Nostril small, without spinules. Lateral margin of frontal

bone almost straight or slightly convex, forming a shallow shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone smooth. Lower jaw not protruding when mouth closed. Opercle with two spines, the upper much longer. Preopercular spine short, about one-third of orbit. Dorsal-fin spines high, fourth the longest. Pelvic-fin large. Third anal-fin spine slender. Body scales finely serrated and slightly striated.

Color when fresh (based on color slides of BPBM 6035 and 18191 taken by Dr. J. E. Randall): Head, ground color of body and all fin rays scarlet. Each longitudinal body scale row with a white stripe, narrower above lateral-line than below it. Jaws and preopercle white. Opercle scarlet dorsally, white ventrally. Inner face of pectoral-fin axil red. Dorsal-fin spines scarlet. Spinous dorsal-fin membranes with scarlet broad submarginal band and pale or white median portion; white triangular speckle just behind tip of each spine. A blackish blotch distally between first and third dorsal-fin spines in some specimens. Anterior margin of pelvic-fin white. First to third anal-fin spines white. Spinous anal-fin membranes scarlet. In the preserved condition, the body color is uniformly yellow or brown, except for the distal dark blotch between first and third dorsal spines. This blotch persists on the syntype of *H. bleekeri* (ZMA 115.176) in spite of its long preservation.

Synonymy. Weber (1913) gave a name *Holocentrum bleekeri* to Bleeker's *H. argenteum*, because he thought that the latter was different from Valenciennes's *H. argenteum*. Later, however, Weber (1929) suspected that *H. microstoma* Günther and *H. bleekeri* were conspecific. The two syntypes of *Adioryx microstomus* (Günther, 1859) have a small spinule on the postero-medial margin of the nasal bone as shown in Fig. 4D (courtesy of Mr. A. C. Wheeler of the British Museum of Natural History). Also, re-examination of Weber's syntype (ZMA 115.176) and two syntypes (RMNH 5436, courtesy of Dr. M. Boeseman) of *H. bleekeri* revealed that *H. bleekeri* has the above mentioned spinules. Hence, *H. argenteum* of Bleeker and *H. bleekeri* Weber are synonyms of *A. microstomus*.

Remarks. Schmidt (1930) and Aoyagi (1941) reported this species from Okinawa Is., but the authors could not obtain any specimens from Japan during this study. As Aoyagi's specimen seems to have been lost, the authors described this species based on specimens from outside of Japan.

Adioryx ruber (Forsskål, 1775)
(Figs. 4E, 14)

(Japanese name: Ayame-ebisu)

Sciaena rubra Forsskål, 1775: 48 (type locality, Djedda, Arabia).

Perca rubra; Bloch and Schneider, 1801: 90.

Holocentrus albo-ruber Lacepède, 1802: 333 (type locality unknown).

Perca praslin Lacepède, 1802: 397 (type locality, Port Praslin, Bougainville Is.).

Holocentrus ruber; Rüppell, 1828: 83, fig. 22-1.

Holocentrum orientale Cuvier, 1829: 197 (type locality, Pondicherry, India).

Holocentrum laticeps Cuvier, 1829: 211 (type locality unknown).

Holocentrum marginatum Cuvier, 1829: 216 (type locality, Indian Ocean).

Holocentrum albo-rubrum; Richardson, 1846: 223.

Holocentrum rubrum; Günther, 1859: 35.

Holocenthrus aureoruber Fowler, 1904a: 504, pl. 10 (type locality, Padang, Sumatra).

Holocenthrus albo-ruber; Fowler, 1904b: 235.

Holocentrus praslin; Jordan and Seale, 1906: 225.

Holocentrus rubrum; Smith, 1949: 152, fig. 295.

Holocentrum dimidicauda Marshall, 1953: 49, fig. 1 (type locality, Calounda, South Queensland, Australia).

Adioryx rubra; Axelrod and Emmens, 1969: 163, with fig. (not numbered).

Adioryx ruber; Burgess and Axelrod, 1972: 234, fig. 413.

Diagnosis. First suborbital bone with a stout spine projecting horizontally on its upper margin.

Specimens examined. 46 specimens, 32.6~277.5 mm SL. HUMZ 40278, May 14, 1974; 40464~40466, Apr. 13, 1974; 40472, Apr. 26, 1974; 40501, Apr. 27, 1974; 40502, 40503, Apr. 26, 1974; 40504, Apr. 16, 1974; 40505, Apr. 13, 1974; 40507, Apr. 27, 1974; 41392,

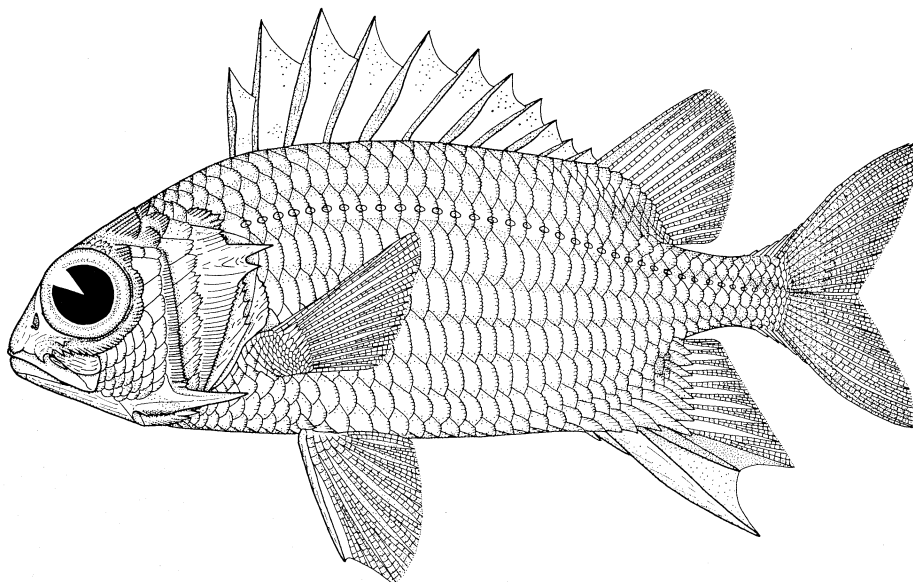


Fig. 14. *Adioryx ruber* (Forsskal, 1775), HUMZ 47948, 137.9 mm SL, Ishigaki Is. Drawing by T. Shimizu.

May 2, 1975; 45336, Apr. 15, 1973; 45337, Apr. 29, 1973; 47790, Apr. 21, 1973; 47839, Jul. 24, 1973; 47948, 47949, Mar. 14, 1974; 62970, Apr. 23, 1977. KSHS 4387, Mar. 31, 1962; 7297~7299, Aug. 1, 1968; 9020, Jul. 29, 1969; 10010, Aug. 8, 1969; 10555, Aug., 1969; 12090, 12091, Jul. 21~Aug. 7, 1971; 13687, Aug. 21, 1972; 13850, Apr., 1973; 14286~14289, 14295, Jul., 1973; 15199, 15200, Mar. 21~25, 1974; 15500~15503, Mar. 25~31, 1974; 15568, 15569, Jul., 1974; 16611, 16614, Oct. 29, 1975; 16685, Oct. 31, 1975. Localities: Okinawa Is., Ishigaki Is., Miyako Is., Okinawa Pref.; Amami-oshima, Yoron Is., Okino-erabu Is., Kagoshima Pref.; Kashiwa Is., Kochi Pref.

Description. D. XI, 13 or 14 (usually 13), Pec. 13~15 (usually 14), A. IV, 8 or 9 (usually 9). Lateral-line scales 34~37 (usually 35). Scales 2.5 above, 8 below lateral-line. Gill rakers 4~7 (usually 6 or 7)+1+8~11 (usually 9 or 10)=14~19 (usually 16 or 17).

Head 2.9~3.3, body depth 2.5~2.9 in SL. Orbit 2.3~3.0; jaws, upper 2.2~2.4, lower 1.8~2.0; dorsal-fin spines, first 2.2~3.3, second 1.6~2.4, third 1.6~2.3; anal-fin spines, third 1.3~1.7, fourth 1.7~2.6 in HL. Snout 1.3~1.9, interorbital 1.4~1.9 in orbit diameter.

Snout profile steep, nape profile gently curved. Spinous dorsal-fin base gently curved. Soft dorsal-fin base not raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril moderate, without spinules. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone with a stout spine projecting horizontally. Lower jaw not protruding when mouth closed. Opercle with two sharp spines, the upper longer. Preopercular spine long, about two-thirds of orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes well incised. Third anal-fin spine stout. Body scales finely serrated, slightly striated.

Color when fresh: Ground color of head and body crimson to violet. Each longitudinal body scale row with a wide white stripe. Dorsal-fin spines red. Spinous dorsal-fin membranes white. Anterior margin of soft dorsal-fin red, the rest of fin yellow. Pectoral-fin yellow. Pelvic-fin with white anterior and dusky posterior margins, the rest of fin reddish. Third anal-fin spine white, fourth anal-fin spine to first anal-fin ray crimson or dusky, the rest of fin yellow. Upper and lower margins of caudal-fin red, medial rays reddish, the rest of fin yellow.

This species shows considerable color variation. In specimens of about 40 mm TL, the ground color is dark violet or almost black, with a silvery blue to red stripe on each longitudinal body scale row. Distal portion of spinous dorsal-fin membranes black. In larger specimens, the ground body color varies from crimson to violet. Sometimes the distal margin of the spinous dorsal-fin membranes are dusky and the anterior margin of pelvic-fin black.

Synonymy. *Holocentrus albo-ruber* Lacepède, 1802 has been regarded as conspecific with *A. ruber* (Günther, 1859; Weber and de Beaufort, 1929; Fowler, 1934; Montilla, 1938; Aoyagi, 1941; Herre, 1953; Matsubara, 1955). However, Jordan and Fowler (1903) believed it might be a valid species. *Perca praslin* Lacepède, 1802 has also been synonymized with *A. ruber* by several authors (Günther, 1859; Weber and de Beaufort, 1929; Herre, 1936, 1953; Montilla, 1938; Matsubara, 1955), while some authors recognized it as a valid species under the name of *Holocentrus praslin* (Jordan and Seale, 1906; Seale, 1906; Jordan and Starks, 1907; Woods, 1953). The holotypes of *Sciaena rubra* (= *A. ruber*), *H. albo-ruber* and *Perca praslin* are lost (Klausewitz and Nielsen, 1965; Bauchot, 1970), so it is difficult to prove that these three nominal species are synonymous. The main differences between *A. ruber* and *H. albo-ruber* and *P. praslin* are coloration; however, as mentioned, the coloration of *A. ruber* shows wide variation, thus these taxa may be conspecific.

Holocentrus albo-ruber and *P. praslin* were named *H. orientale* by Cuvier (1829). In the original description of *H. orientale*, the spine projecting outwards on the first suborbital bone, the most diagnostic character of *A. ruber*, was clearly mentioned by Cuvier (1829: 198). Moreover, *H. orientale* was synonymized with *H. ruber* by Bauchot (1970) based on the examination of the holotype. Thus *H. orientale* is a synonym of *A. ruber*.

Holocentrum marginatum Cuvier, 1829 was placed in synonymy with *H. ruber* by Bauchot (1970) based on the examination of the holotype.

Holocentrum laticeps Cuvier, 1829 was also synonymized with *H. ruber* by Bauchot (1970)

based on the examination of three specimens (A. 2629, 2 specimens, and A. 2680) used by Valenciennes (1831) for the supplemental description of *H. laticeps*.

Holocentrus aureoruber Fowler, 1904 has a spine on the first suborbital bone which is clearly described and well figured (Fowler, 1904a), and in other respects it agrees fairly well with *A. ruber*. We follow Weber and de Beaufort (1929) in considering *H. aureoruber* a synonym of *A. ruber*.

Holocentrum dimidicauda Marshall, 1953 has 35 lateral-line scales, a large nostril without spinules and a strong outwardly pointing preorbital spine. Although Marshall distinguished it from *H. ruber* and *H. praslin* by proportional and color differences, these fall within the range of variation of *A. ruber*. Therefore we consider *H. dimidicauda* to be a junior synonym of *A. ruber*.

Onomatology. As the gender of *Adioryx* is masculine, the feminine form *rubra* (Axelrod and Emmens, 1969) is incorrect.

Remarks. The spine on the first suborbital bone is not distinct in specimens less than about 60 mm SL.

This fish may be the most widely distributed species of *Adioryx*, for it is known from the Mediterranean, Red Sea, Indian Ocean, Australia, western Pacific and Japan.

Adioryx tiereoides (Bleeker, 1853)

(Figs. 4F, 15)

(New Japanese name: Sakura-ebisu)

Holocentrum tiereoides Bleeker, 1853c: 334 (type locality, Amboina).

Holocentrus tiereoides; Seale, 1906: 20.

Adioryx tiereoides; Randall, 1973: 181.

Diagnosis. Nostril, posterior portion of nasal bone and upper margin of first suborbital bone without spination. Lateral-line scales 40~41.

Specimens examined. Three specimens, 102.9~120.4 mm SL. HUMZ 40283, Aug. 1, 1967, Sohana Wharf, Buka Is., Papua-New Guinea. BPBM 16234 (2 specimens), Jul. 30, 1973, Florida Is., Solomon Islands.

Description. D. XI, 13 or 14, Pec. 13 or 14 (usually 14), A. IV, 9. Lateral-line scales 40 or 41. Scales 2.5 above, 8 below lateral-line.

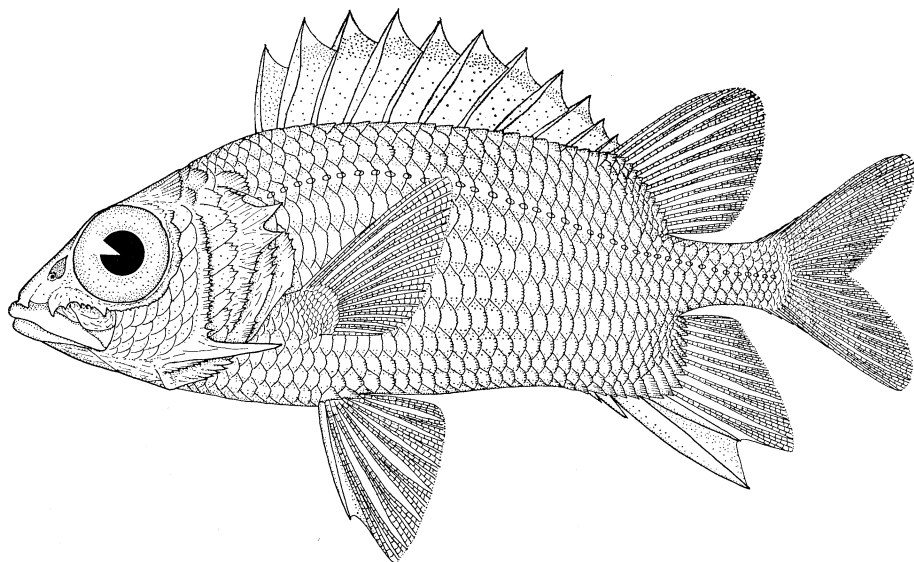


Fig. 15. *Adioryx tiereoides* (Bleeker, 1853), BPBM 16243, 115.5 mm SL, Florida Is., Solomon Islands. Drawing by T. Shimizu.

Gill rakers 7+1+12 or 13=20 or 21.

Head 2.8~3.0, body depth 2.7~2.8 in SL. Orbit 2.5~2.8; jaws, upper 2.3~2.6, lower 1.8~1.9; dorsal-fin spines, first 2.9~4.1, second 2.5~2.9, third 2.3~2.5; anal-fin spines, third 1.5~1.6, fourth 1.9~2.1 in HL. Snout 1.3, interorbital 1.6~2.1 in orbit diameter.

Head profile straight. Head rather pointed. Spinous dorsal-fin base almost straight. Soft dorsal-fin base not raised. Anterior tip of nasal bone with two divergent spines. Posterior portion of nasal bone without spinations. Nostril large, without spinule. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital concave. Upper margin of first suborbital bone smooth, but postero-ventral portion has a few serrae. Lower jaw not protruding when mouth closed. Opercle with two spines, the upper slightly longer. Preopercular spine long, slightly longer than two-thirds of orbit. Dorsal-fin spines low. Spinous dorsal-fin membranes incised. Third anal-fin spine moderate. Cheek with four scale rows. Body scales finely serrated, not striated.

Color when fresh (based on color slides of a specimen from Tahiti taken by Dr. J. E. Randall): Head, ground color of body and all fin rays red. Each longitudinal body scale

row with a whitish stripe, narrow and vague dorsally, wide and distinct ventrally. Spinous dorsal-fin membranes vaguely red, with a longitudinal red band along the distal margin. This band spreads across almost the whole area of the dorsal-fin membranes between the first and second spines. A small triangular white spot just behind tip of each dorsal-fin spine. Small white spot at the base of first and second dorsal-fin spines. Anterior margin of pelvic-fin white. Anterior edge of third anal-fin spine whitish. Spinous anal-fin membranes red. Jaws whitish.

Remarks. Snyder (1912) recorded *Holocentrus binotatus* from Okinawa Island. Okada and Matsubara (1938) included *Holocentrus binotatus* in the ichthyofauna of Japan and gave it the Japanese name "niten-ebisu" without citation of the references. They may quote Snyder's record. Aoyagi (1941) described *Holocentrus tiereoides* and called it "niten-ebisu" quoting Snyder's record, since he (1943) regarded *Holocentrus binotatus* as the synonym of *H. tiereoides*. As was pointed out by Woods (1953), *Holocentrus binotatus* is nothing more than the synonym of *Adioryx spinifer*. Therefore *Adioryx tiereoides* may not have been recorded from Japan so far, for Snyder's description is too short to ascertain the species.

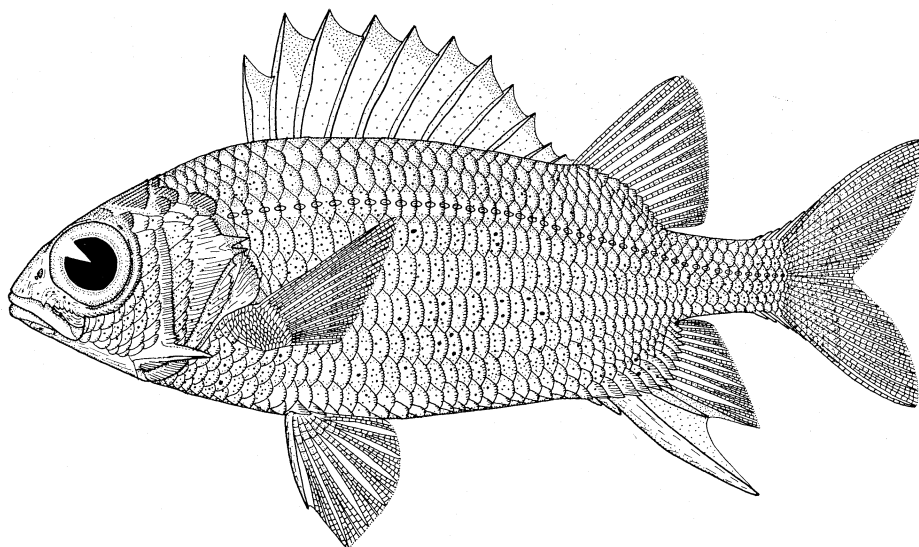


Fig. 16. *Adioryx lacteoguttatus* (Cuvier, 1829), HUMZ 47231, 126.1 mm SL, Okinawa Is. Drawing by T. Shimizu.

There is, however, still a possibility that this species may be found in Japan. The description and the new Japanese name are based on specimens from Papua-New Guinea and the Solomon Islands.

Bryan and Herre (1903: 128) reported *Holocentrus tiereoides* from Marcus Island (BPBM 2410, 93.4 mm SL). Our re-examination of this specimen reveals that they erroneously identified *Adioryx caudimaculatus* as *H. tiereoides*. Seale (1906: 20) may be the first reviser of *Holocentrus tiereoides*.

Adioryx lacteoguttatus (Cuvier, 1829)
(Fig. 16)

(Japanese name: Hoshi-ebisu)

Holocentrum lacteo-guttatum Cuvier, 1829: 214
(type locality, Indian Ocean).

Holocentrum punctatissimum Cuvier, 1829: 215
(type locality, Strong Is., Caroline Islands).

Holocentrum diploxiphus Günther, 1871: 660,
pl. 60 (type locality, Samoa).

Holocentrus gladispinis Fowler, 1904b: 225,
fig. 1 (type locality, Tahiti).

Holocentrus gracilipinis Fowler, 1904b: 228,
fig. 2 (type locality, Honolulu).

Holocentrus punctatissimus; Jordan and Evermann, 1905: 162, fig. 60.

Holocentrus lacteoguttatus; Fowler, 1922: 82.

Holocentrus (*Faremusca*) *punctatissimus*;
Whitley, 1933: 68.

Holocentrus lacteo-guttatus; Herre, 1936: 67.

Faremusca lacteo-guttata; Fowler, 1944: 188.

Faremusca lacteoguttata termastigma Fowler,
1946: 127, fig. 2 (type locality, Naha, Okinawa, Japan).

Adioryx lacteoguttatus; Axelrod and Emmens,
1969: 161, with fig. (not numbered).

Diagnosis. Scales above lateral-line 2.5. Nostril without spinules. Lateral-line scales 42~45. Frontal bone forming a distinct shelf over antero-dorsal portion of orbit. Small black or brown spots of unequal size on whole body.

Specimens examined. 23 specimens, 93.9~127.6 mm SL. HUMZ 45338~45342, Apr. 29, 1973; 47231, Apr. 20, 1974; 47957, date unknown; 47978, 47981, 48015, 48018, 48032, Apr. 13, 1974; 48312, Apr. 17, 1974; 48661~48663, 48670, Apr. 13, 1974; 62994, 62995, Apr. 24, 1977; 63067~63069, Apr. 30, 1977; 63088, May 3, 1977. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.

Description. D. XI, 12~14 (usually 13), Pec. 15, A. IV, 9. Lateral-line scales 42~45. Scales 2.5 above, 8 or 9 below lateral-line. Gill rakers 5~7 (usually 6)+1+9~11=15~19 (usually 17 or 18).

Head 3.0~3.4, body depth 2.7~3.1 in SL.

Orbit 2.3~3.0; jaws, upper 2.6~3.0, lower 2.0~2.4; dorsal-fin spines, first 2.5~3.3, second 1.9~2.4, third 1.7~2.2; anal-fin spines, third 1.2~1.4, fourth 1.7~2.3 in HL. Snout 1.4~1.8, interorbital 1.2~1.4 in orbit diameter.

Snout profile steep, nape profile gently curved. Spinous dorsal-fin base slightly curved. Soft dorsal-fin base slightly raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril small, without spinule. Frontal bone forming a distinct shelf over antero-dorsal portion of orbit. Interorbital flat and wide. Upper margin of first suborbital bone smooth. Upper jaw not protruding when mouth closed. Opercle with two sharp spines, the lower slightly longer. Preopercular spine short, about a half of orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes incised. Third anal-fin spine long, slender. Body scales finely serrated, striated.

Color when fresh: Small black or brown spots of unequal size scattered over entire body. Head and body bright red, belly silvery red. Each longitudinal body scale row with a stripe, silvery dorsally, whitish ventrally. Dorsal-fin spines pale red. Distal portion of spinous dorsal-fin membranes red, the rest of fin white. Soft dorsal- and pectoral-fins reddish. Pelvic-fin pale. Third anal-fin spine white, spinous anal-fin membranes red, the rest of fin pale. Caudal-fin red. A red band from nape through humeral to inner face of pectoral-fin axil.

Synonymy. Klauswitz and Bauchot (1967) synonymized *Holocentrum punctatissimum* Cuvier, 1829 with *H. lacteoguttatum* Cuvier, 1829 based on the examination of both holotypes.

Holocentrum diploxiphus Günther, 1871 closely resembles *Adioryx lacteoguttatus* except for its higher count of lateral-line scales and weak punctation. Jordan and Seale (1906) and Fowler (1928) synonymized *H. diploxiphus* with *H. punctatissimus* (= *lacteoguttatus*, see above) without any discussion. Weber and de Beaufort (1929), on the other hand, cast doubt on this synonymy. *Holocentrum diploxiphus* has 45~47 lateral-line scales which slightly overlap with the specimens of *lacteoguttatus*

(42~45) examined in this study. According to Günther's description, the larger specimen has weak punctation, but the smaller one has full punctation as known for the present species. In view of other similarities we think the placement of *diploxiphus* in synonymy with *lacteoguttatus* is justified.

Holocentrus gladispinis Fowler, 1904 and *H. gracilipinis* Fowler, 1904 were synonymized with *Holocentrus lacteoguttatus* by Fowler (1928). The diagnostic feature of *A. lacteoguttatus*, the shelf over the antero-dorsal portion of the orbit, is present in both of these nominal species. They are probably conspecific with *A. lacteoguttatus*.

Fowler (1946) described *Faremusca lacteoguttata termastigma* from a single specimen from Okinawa. He distinguished this subspecies by the black distal edge of its spinous dorsal-fin. Among the 98 specimens of *A. lacteoguttatus* from the Ryūkyū Islands, the authors found none with coloration as described by Fowler. Fowler's specimen may have been an individual variant of the present species. The authors conclude that there is no satisfactory basis for the establishment of this subspecies.

Adioryx tiere (Cuvier, 1829)

(Fig. 17)

(Japanese name: Aosuji-ebisu)

Holocentrum tiere Cuvier, 1829: 202 (type locality, Tahiti).

Holocentrum poecilopterus Bleeker, 1854: 356 (type locality, Cocos Is.).

Holocentrum erythraeum Günther, 1859: 32 (type locality, San Cristobal Is., Solomon Islands).

Holocentrus erythraeus; Smith and Swain, 1882: 127.

Holocentrus erythroeus; Waite, 1903: 3.

Holocentrus polynesiae Fowler, 1904b: 229, fig. 3 (type locality, Thornton Is., Polynesia). *Holocentrus tiere*; Seale, 1906: 24.

Adioryx tiere; Axelrod and Emmens, 1969: 165, with fig. (not numbered).

Diagnosis. Scales above lateral-line 2.5. Nostril without spinules. Lateral-line scales 47~52. Preopercular spine long, subequal to orbit.

Specimens examined. 18 specimens, 180.9~

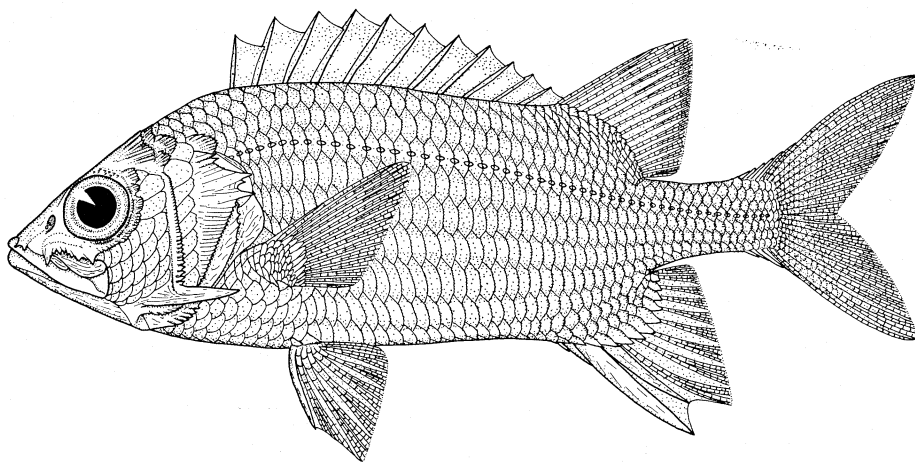


Fig. 17. *Adioryx tiera* (Cuvier, 1829) HUMZ 41394, 212.5 mm SL, Ishigaki Is. Drawing by T. Shimizu.

257.6 mm SL. HUMZ 40467, 40473, Apr. 16, 1974; 41394, 41395, 41398, May 2, 1975; 41416, 41417, May 3, 1975; 45167, 45168, Apr. 16, 1974; 45220, 45301, Apr. 23, 1973; 62878, Apr. 15, 1977; 63071, May 1, 1977. KSHS 5453, Aug., 1966; 12522, Mar. 17, 1972; 14391, Jul., 1973; 15197, Mar. or Apr., 1974; 16969, Nov. 4, 1975. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.; Amami-oshima, Kogoshima Pref.

Description. D. XI, 14, Pec. 14 or 15 (usually 14), A. IV, 9. Lateral-line scales 47~52. Scales 2.5 above, 8 below lateral-line. Gill rakers 6~8 (usually 7)+1+12~14=19~23 (usually 21 or 22).

Head 2.9~3.3, body depth 2.7~3.0 in SL. Orbit 3.1~3.8; jaws, upper 1.9~2.2, lower 1.5~1.8; dorsal-fin spines, first 4.0~4.9, second 3.1~4.0, third 2.6~3.5; anal-fin spines, third 1.4~1.9, fourth 2.0~2.5 in HL. Snout 0.9~1.1, interorbital 1.2~1.7 in orbit diameter.

Head profile gently curved. Spinous dorsal-fin base slightly curved. Soft dorsal-fin base raised. Anterior tip of nasal bone with two divergent spines. Posterior portion of nasal bone smooth. Frontal bone not forming a shelf over antero-dorsal portion of orbit. Interorbital flat. Upper margin of first sub-orbital bone smooth. Lower jaw not protruding when mouth closed. Opercle with two flat, short spines, the upper slightly

longer. Preopercular spine long, subequal to orbit. Dorsal-fin spines low. Fourth anal-fin spine long, slightly shorter than the third. Body scales finely serrated, not striated.

Color when fresh: Head, body and all fins crimson. Each longitudinal body scale row with a bluish stripe. This stripe is very clear in life (personal communication from Mr. T. Yoshino). A small, triangular white spot just behind the tip of dorsal spines. Each spinous dorsal-fin membrane with a medial whitish patch.

Synonymy. *Holocentrum poecilopterus* Bleeker, 1853 was regarded as the synonym of *H. tiera* by Jordan and Seale (1906) with a brief discussion. This nominal species has 52 lateral-line scales, 2.5 scales above the lateral-line, a long preopercular spine about equal to the eye diameter and a nostril without spines (Bleeker, 1854; Günther, 1859; Bleeker, 1873b). These characters coincide with the diagnosis of *Adioryx tiera*. *Holocentrum poecilopterus* is therefore a synonym of *A. tiera*.

Although regarded by Günther (1859, 1875) and Fowler (1928) as a valid species, *Holocentrum erythraeum* Günther, 1859 was synonymized with *H. tiera* by Woods (1953) based on his detailed study.

Holocentrus polynesiae Fowler, 1904 was synonymized with *H. tiera* by Jordan and Seale (1906) and Fowler (1928), a decision with which the authors concur.

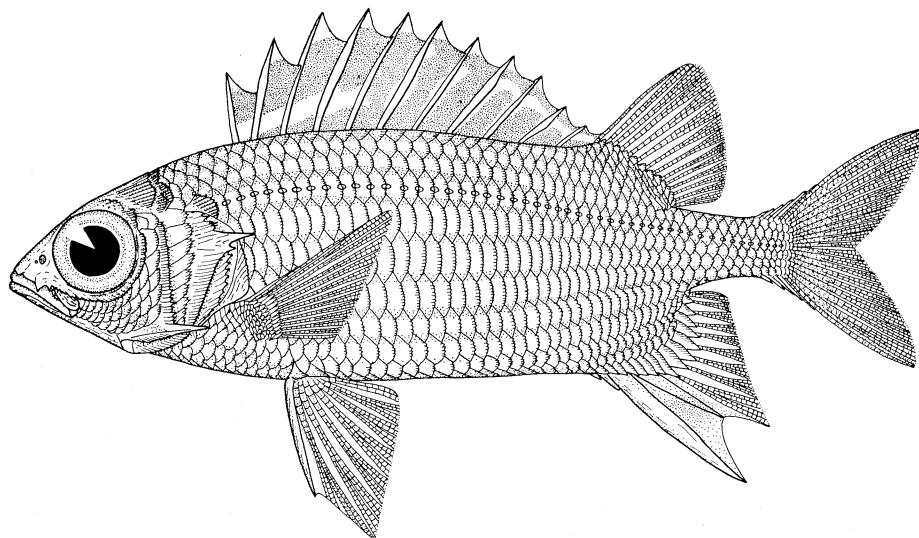


Fig. 18. *Adioryx diadema* (Lacepède, 1802), HUMZ 40265, 113.5 mm SL, Okinawa Is. Drawing by T. Shimizu.

Adioryx diadema (Lacepède, 1801)

(Figs. 5C, 18)

(Japanese name: Niji-ebisu)

Holocentrus diadema Lacepède, 1801, fig. 32-3 (type locality, unknown); 1802: 335, 372.
Perca pulchella Bennett, 1827: 377 (type locality, Sumatra).

Holocentrum diadema; Cuvier, 1829: 213.

Adioryx diadema; Axelrod and Emmens, 1969: 160, with fig. (not numbered).

Diagnosis. Spinous dorsal-fin membranes almost black, with white oblique bands.

Specimens examined. 19 specimens, 107.4~131.2 mm SL. HUMZ 40258~40260, Apr. 18, 1974; 40261, Apr. 14, 1974; 40262, Apr. 28, 1974; 40263, May 13, 1974; 40264, Apr. 20, 1974; 40265, May 11, 1974; 40266, Aug. 1, 1973; 47954, 47965, Apr. 7, 1974; 48317, Apr. 12, 1974; 62887, Apr. 16, 1977. KSHS 11619, Nov., 1970; 11647, Apr., 1971; 12092, Jul. 21~Aug. 7, 1971; 12218, 12219, Sep., 1971; 14393, Jul., 1973. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.; Amami-oshima, Kagoshima Pref.

Description. D. XI, 13 or 14, Pec. 13~15 (usually 14), A. IV, 8~10 (usually 9). Lateral-line scales 46~50. Scales 2.5 above, 8 or 9 below lateral-line. Gill rakers 4~6 (usually 6)+1+11~14 (usually 12 or 13)=16~21 (usually 19 or 20).

Head 2.9~3.6, body depth 2.7~3.2 in SL. Orbit 2.2~2.7; jaws, upper 2.7~2.9, lower 2.0~2.3; dorsal-fin spines, first 2.9~3.7, second 1.9~2.8, third 1.6~2.1; anal-fin spines, third 1.1~1.3, fourth 1.7~2.1 in HL. Snout 1.3~1.8, interorbital 1.5~1.8 in orbit diameter.

Body much compressed, rather elongate. Head profile gently curved. Spinous dorsal-fin base almost straight. Soft dorsal-fin base well raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril small, without spinules. Lateral margin of frontal bone almost straight or slightly convex, forming a shallow shelf over antero-dorsal portion of orbit. Interorbital slightly concave. Upper margin of first sub-orbital bone smooth. Lower jaw not protruding when mouth closed. Opercle with two spines, the upper stout and much longer. Preopercular spine short, less than a half of orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes incised. Third anal-fin spine long, slender. Cheek with four scale rows. Body scales finely serrated and striated.

Color when fresh: Spinous dorsal-fin membranes black, with small triangular white spot just behind the tip of each spine; a white band runs upwards from base of first dorsal spine to fifth spine; a submarginal white band from eighth to eleventh spines. Ground color

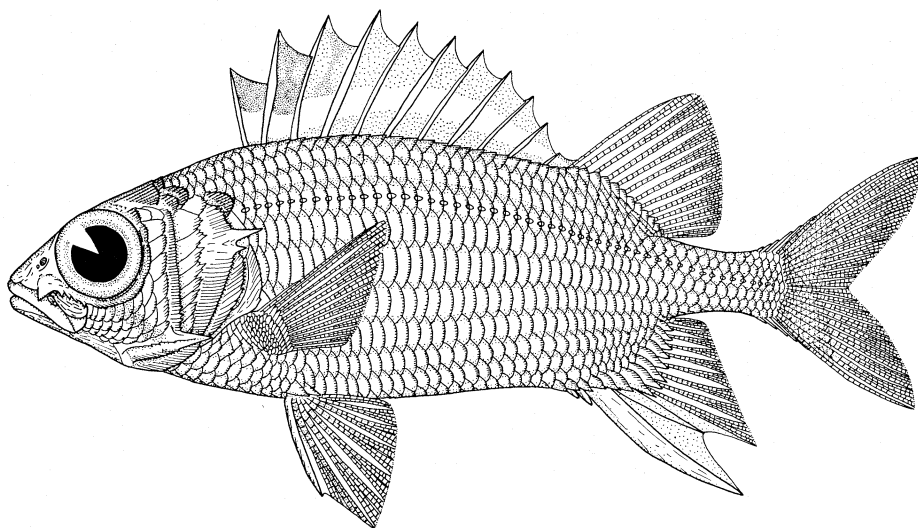


Fig. 19. *Adioryx ittodai* (Jordan et Fowler, 1903), HUMZ 47492, 127.7 mm SL, Okinawa Is.
Drawing by T. Shimizu.

of head and body red. Each longitudinal body scale row with a white stripe. A white band from cheek to upper jaw. Anterior margin of soft dorsal-fin red, the rest of fin pale. Pectoral-fin reddish. Anterior margin of pelvic-fin white, first ray red, the rest of fin pale. Third anal-fin spine white, spinous anal-fin membranes red or dusky, the rest of fin pale. Anterior margin of both caudal-fin lobes red, the rest of fin pale. Inner face of pectoral-fin axil brick red.

Synonymy. The authors follow Günther (1859) in placing *Perca pulchella* Bennett, 1827 in the synonymy of *A. diadema*. Bennett's description of *P. pulchella* is too short to ascertain the species. It is thought that Günther might have examined Bennett's specimen.

Adioryx ittodai (Jordan et Fowler, 1903)
(Figs. 5D, 19)

(Japanese name: Teri-ebisu)

Holocentrus ittodai Jordan and Fowler, 1903: 16, fig. 4 (type locality, Naha, Okinawa, Japan).

Faremusca ittodai; Fowler, 1946: 127.

Adioryx ittodai; Masuda, Araga and Yoshino, 1975: 197, pl. 31-G.

Diagnosis. Lateral-line scales 47~49. Distal half of spinous dorsal-fin membranes between first and third spines black.

Specimens examined. 77 specimens, 97.0~144.7 mm SL. HUMZ 40423~40425, Apr. 15, 1973; 40426~40429, Apr. 29, 1973; 40430~40432, Apr. 30, 1973; 47236, 47237, Apr. 8, 1974; 47239, Apr. 20, 1974; 47240, Apr. 12, 1974; 47243, 47246, 47726, Apr. 8, 1974; 47727, Apr. 12, 1974; 47757, Apr. 4, 1974; 47801, 47812, Apr. 15, 1973; 47815, date unknown; 47822, Apr. 26, 1973; 47829, date unknown; 47852, Jul. 1, 1973; 47855, 47856, date unknown; 47942, Apr. 4, 1974; 47960, Apr. 8, 1974; 47962, Mar. 6, 1974; 47967, Apr. 8, 1974; 47968, Apr. 12, 1974; 47969, Apr. 8, 1974; 47972, Mar. 6, 1974; 47973, 47983, 47984, Apr. 8, 1974; 47987, 47988, Apr. 12, 1974; 47989, Apr. 20, 1974; 47992, Apr. 8, 1974; 47993, Apr. 12, 1974; 47994, Apr. 8, 1974; 47998, Apr. 12, 1974; 48000, 48004, 48006, Apr. 8, 1974; 48008, Apr. 4, 1974; 48009, Apr. 12, 1974; 48011, Apr. 4, 1974; 48012, Apr. 8, 1974; 48013, 48014, Apr. 12, 1974; 48017, Apr. 4, 1974; 48021, Apr. 8, 1974; 48022, 48026, 48028, Apr. 12, 1974; 48029, 48033, 48036, 48037, Apr. 8, 1974; 48039, Apr. 12, 1974; 48040, 48041, Apr. 8, 1974; 48045, date unknown: 48319, Apr. 8, 1974; 48323, 48654, 48657, Apr. 12, 1974; 48658~48660, Apr. 8, 1974; 48665, Apr. 12, 1974; 48667, Apr. 8, 1974; 48669, 48671, Apr. 12, 1974. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.

Description. D. XI, 12~14 (mostly 13), Pec. 14~16 (mostly 15), A. IV, 9 or 10 (mostly 9). Lateral-line scales 46~49. Scales 2.5 above, 8 or 9 (mostly 9) below lateral-line. Gill rakers 4~6 (usually 5 or 6)+1+11~13 (usually 12 or 13)=17~20 (usually 19 or 20).

Head 3.0~3.5, body depth 2.8~3.3 in SL. Orbit 2.2~2.7; jaws, upper 2.5~2.8, lower 1.9~2.1; dorsal-fin spines, first 2.4~3.3, second 1.8~2.5, third 1.6~2.2, anal-fin spines, third 1.1~1.5, fourth 1.6~2.2 in HL. Snout 1.4~1.8, interorbital 1.4~1.8 in orbit diameter.

Snout profile rather steep, nape profile gently curved. Spinous dorsal-fin base gently curved. Soft dorsal-fin base slightly raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril small, without spinules. Lateral margin of frontal bone almost straight or slightly convex, forming a shallow shelf over antero-dorsal portion of orbit. Interorbital slightly concave. Upper margin of first suborbital bone smooth. Lower jaw not protruding when mouth closed. Opercle with two flat, stout spines; the upper much longer. Preopercular spine short, about one-third of orbit. Dorsal-fin spines high. Spinous dorsal-fin membranes incised. Third anal-fin spine sharp and long. Cheek with four scale rows. Body scales finely serrated and slightly striated.

Color when fresh: A distinct black blotch between distal half of first and third dorsal-fin spines, distal membranes between third and fifth spines slightly dusky. Spinous dorsal-fin membranes red, with a white band running lengthwise from base of first spine to middle portion of fin membranes, small triangular spot just behind tip of each dorsal spine. Ground color of head and body red, bright above, faint below. Each longitudinal body scale row with a wide, white stripe. A white band from snout tip to ventral limb of preopercle. Nape through humeral to inner face of pectoral axil red. Dorsal-fin spines, soft dorsal- and pectoral-fins red. Anterior margin of pelvic-fin white, first ray red, the rest of fin whitish. Third anal-fin spine white, spinous anal-fin membranes red, the rest of fin whitish. Anterior margin of both caudal-fin lobes red, the rest of fin whitish.

Remarks. Besides Japan, this species is reported only from Sri-Lanka (Vasiliu, 1931: 328; Munro, 1955: 87) and Taiwan by Burgess and Axelrod (1974: 1061, fig. 406; 1063, figs. 411, 412), although the latter authors regarded it as "*Adioryx* sp. (possibly *A. spinosissimus*)."

The black blotch on spinous dorsal-fin membranes is not discernable in some specimens from Miyake Is., Izu Islands, Japan and south Taiwan (based on color slides taken by Dr. J. E. Randall). But the lengthwise white band in the middle portion of spinous dorsal-fin membranes and other colorations are quite identical with other specimens from Japan. The absence of black blotch may be an infraspecific variation.

Genus *Flammeo* Jordan et Evermann, 1898
(Fig. 2B, C)

(Japanese name: Ukeguchi-ittodai zoku)

Neoniphon Castelnau, 1875: 4, type species, by monotypy, *Neoniphon armatus* Castelnau, 1875: 5.

Flammeo Jordan and Evermann, 1898: 2871, type species, by original designation, *Holocentrum marianum* Cuvier, 1829: 219.

Kutaflammeo Whitley, 1933: 69, type species, by original designation, *Holocentrum tahiticum* Kner, 1864: 482.

Diagnosis. Last dorsal spine nearer to first dorsal ray than penultimate spine. Lower jaw protruding when mouth closed.

Synonymy. The synonymy and application of *Neoniphon* follow the opinion of Woods (1955) and Woods and Sonoda (1973).

Whitley (1933) recognized three subgeneric groups among the species of *Holocentrus* and proposed the subgeneric name *Kutaflammeo* for *Holocentrum tahiticum* (= *F. sammara*, see synonymy of *F. sammara*). Munro (1967) elevated *Kutaflammeo* to generic rank without showing any differences from other genera. The species included in *Kutaflammeo* (*argenteus*, *sammara* and *opercularis*, see each synonymy) differ from the Pacific *F. scythrops* and the Atlantic *F. marianus* in general coloration and in possessing a longer last dorsal spine than the penultimate one (Fig. 2B, C). These

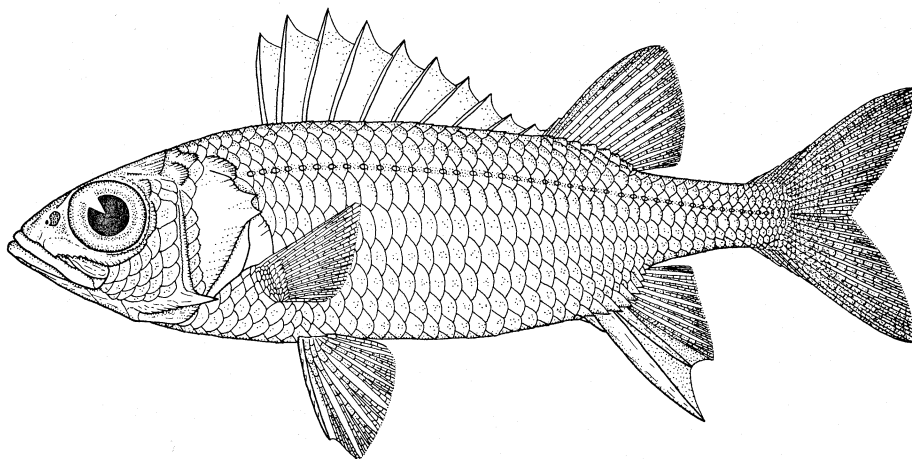


Fig. 20. *Flammeo argenteus* (Valenciennes, 1831), HUMZ 40443, 181.5 mm SL, Ishigaki Is.
Drawing by T. Shimizu.

differences, however, may be too trivial to verify the distinction at the generic level. The authors tentatively place *Kutaflammeo* in the synonymy of *Flammeo*.

Key to the species of *Flammeo*
(Fig. 2B, C)

- A₁ Last dorsal spine longer than the penultimate one (Fig. 2B). Scales above lateral-line 2.5.
 - B₁ Pectoral-fin rays 12 or 13, usually 13. Spinuous dorsal-fin membranes immaculate *F. argenteus*
 - B₂ Pectoral-fin rays 13 or 14, mostly 14. Spinuous dorsal-fin membranes with dark pigmentation.
 - C₁ Anal-fin rays 7 or 8, usually 8. A large black blotch distally between first and third dorsal-fin spines..... *F. sammara*
 - C₂ Anal-fin rays 9. Spinuous dorsal-fin membranes black, with a white oblique band *F. opercularis*
- A₂ Last dorsal spine shorter than the penultimate one (Fig. 2C). Scales above lateral-line 3.5 *F. scythrops*

Flammeo argenteus (Valenciennes, 1831)
(Fig. 20)

(Japanese name: Hoso-ebisu)

Holocentrum argenteum Valenciennes, 1831:

502 (type locality, New Guinea).

Holocentrum stercus-muscarum Valenciennes, 1831: 503 (type locality, Guam Is.).

Holocentrum laeve Günther, 1859: 47 (type locality, Louisiade Arch.; Guadalcanal Is., Solomon Islands; Amboina).

Holocentrum goldiei Macleay, 1883: 352 (type locality, New Guinea).

Rhynchichthys novae-britanniae De Vis, 1884: 447 (type locality, New Britain Is.).

Flammeo achromopterus Fowler, 1904b: 236, fig. 6 (type locality, Samoa).

Holocentrus laevis; Jordan and Seale, 1906: 226.

Holocentrus angustifrons Ogilby, 1908: 32 (type locality, New Britain Is.).

Holocentrus (Flammeo) laevis; Woods, 1955: 92.

Kutaflammeo angustifrons; Munro, 1967: 141.

Kutaflammeo laevis; Munro, 1967: 141, pl. 15-fig. 223.

Holocentrum stercusmuscarum; Klausewitz and Bauchot, 1967: 125, fig. 4.

Flammeo laeve; Burgess and Axelrod, 1973: 693, fig. 173.

Flammeo laevis; Bagnis and others, 1974: 238, with fig. (not numbered).

Diagnosis. Pectoral-fin rays 12 or 13 (usually 13). Spinuous dorsal-fin membranes immaculate.

Specimens examined. Seven specimens, 117.9~183.6 mm SL. BSKU 10591, Nov. 1961. HUMZ 40443, Apr. 26, 1973; 62974, 62975, Apr. 23, 1977. KSHS 15158, 15493, 15494, Mar., 1974. Locality: Ishigaki Is.,

Okinawa Pref.

Fifteen specimens from Papua-New Guinea were also examined to assist the authors in confirming the synonymy. 87.0~139.3 mm SL. HUMZ 40233, 40234, north side of Buriwad Is., Trobriand Islands; 40285~40287, Casuarina Is., Bougainville; 40291~40295, Fisherman Is., Port Moresby; 40296, Motupone Is., Bootless Bay, Port Moresby; 40299, Por Is., Siassi Group. Syntype of *Holocentrum goldiei* AM I. 16285-001 (3 specimens).

Description. D. X-I, 11~13 (mostly 12), Pec. 12 or 13 (mostly 13), A. IV, 7~9 (mostly 8). Lateral-line scales 38~43 (usually 40 or 41). Scales 2.5 above, 7 or 8 (usually 8) below lateral-line. Gill rakers 4~7 (usually 6)+1+7~11 (usually 10)=14~18 (usually 16 or 17).

Head 2.7~3.4, body depth 3.1~3.7 in SL. Orbit 2.4~3.0; jaws, upper 2.2~2.3, lower 1.7~1.8; dorsal-fin spines, first 2.4~3.1, second 1.9~2.3, third 1.9~2.1; anal-fin spines, third 1.4~1.6, fourth 1.9~2.4 in HL. Snout 1.2~1.6, interorbital 1.2~1.7 in orbit diameter.

Body slender, spinous dorsal-fin high. Head profile gently curved. Spinous dorsal-fin base almost straight. Caudal peduncle rather deep. Snout rather long. Lower jaw protruding when mouth closed. Nostril large, without spination. Nasal bone and upper margin of first suborbital bone smooth. Lower margin of first suborbital bone with weak serrae. Lateral margin of frontal bone convex, forming a shallow shelf over antero-dorsal portion of orbit. Interorbital wide, flat. Opercle with two blunt spines, both almost the same size. Opercular bones with weak striations. Preopercular spine short, about one-third or one-quarter of orbit. Dorsal-fin spines slender, weak; the first one a little shorter than the second, third the longest. First dorsal-fin spine close to second one. Spinous dorsal-fin membranes incised. Pectoral-fin small. Cheek with four scale rows. Body scales finely serrated, not striated.

Color when fresh: Spinous dorsal-fin membranes immaculate, only slightly dusky distally. Head deep brown dorsally. Ground color of head and body silvery, bluish dorsally, whitish ventrally. Each longitudinal

body scale row with a faint dark spot in center, these spots forming longitudinal bands. Lateral-line scale row with a distinct brown stripe. Anterior margin of soft dorsal-fin reddish. Pectoral-fin reddish. Pelvic-fin white. Third anal-fin spine white, fourth anal-fin spine and first anal-fin ray reddish, the rest of fin pale red. Anterior margin of both caudal-fin lobes white, a few outer caudal rays brick red, inner caudal rays pale red. Inner face of pectoral-fin axil red.

Synonymy. *Holocentrum laeve* Günther, 1859 has long been recognized as a valid species (Günther, 1875; Jordan and Seale, 1906; Fowler, 1925; Woods, 1953; Randall, 1955). But it was synonymized with *Holocentrum stercusmuscarum* by Klausewitz and Bauchot (1967) based on their examination of the holotype of the latter species. We agree with their conclusion. However, we do not agree with their recognition of *Holocentrum argenteum* and *H. stercusmuscarum* as distinct species. The meristic characters of the holotype of the latter species are included in the range of those characters of the lectotype and paralectotypes of the former (Table 1). The only decisive character between them is the stripe on the body, being evident in *H. stercusmuscarum* but absent in *H. argenteum* (Klausewitz and Bauchot, 1967). Among the specimens of *F. argenteus* examined in this study, the stripe on the body is obvious on some specimens from Papua-New Guinea, but very faint in most; it is also faint in specimens from Japan. In view of this variability, we regard *H. stercusmuscarum* to be a junior synonym of *F. argenteus*.

Holocentrum goldiei Macleay, 1883 was synonymized with *Holocentrus laevis* by Jordan and Seale (1906) and Fowler (1928) without any discussion. Weber and de Beaufort (1929) placed it in the synonym of *H. sammara*. Examination of the three syntypes of *H. goldiei* shows that they agree well with *F. argenteus* (Table 1). The syntypes of *H. goldiei* and some specimens of *F. argenteus* from Papua-New Guinea have a rather narrow interorbital width when compared with the specimens of *F. argenteus* from Japan. This may be a geographical divergence. Thus, *H. goldiei* is judged to be a junior synonym of *F. argenteus*.

Table 1. Comparison of the nominal species from the western Pacific which ally with *Flammeo argenteus*. All specimens have 11 dorsal- and four anal-fin spines, except HUMZ 62975 which has 12 dorsal-fin spines. Data on *Holocentrum argenteum* and *H. stercusmuscarum* are from Klauswitz and Bauchot (1967). Pectoral-fin counts are from the left side; the exception is presented as left side/right side. A*, B*, and C* are the authors' designations.

Species : Specimens	Locality	SL (mm)	Rays			L.l. scales	Interorbital/ orbit
			D.	A.	Pec.		
<i>Holocentrum argenteum</i>							
Lectotype A. 2638	New Guinea	119	12	8	13	38	
Paralectotype B. 2531		115	12	8	13	41	
A. 2639a		107	12	8	13	39	
A. 2639b		99	12	8	13	39	
<i>Holocentrum stercusmuscarum</i>							
Holotype A. 2637	Guam Is.	61	12	8	13	41	
<i>Flammeo argenteus</i>							
7 specimens	Ishigaki Is., Japan	117.9~ 183.4	11~ 12	8	13	39~41	0.69~ 0.81
12 specimens	Papua- New Guinea	78.0~ 139.3	12~ 13	7~ 8	12~ 13	38~42	0.58~ 0.72
<i>Holocentrus goldiei</i>							
Syntypes AM I. 16285-001 A*	Port Moresby,	133.6	12	8	13	43	0.67
B*	New Guinea	105.6	12	8	13	39	0.66
C*		104.7	12	9	13	41	0.61
<i>Holocentrus angustifrons</i>							
Holotype	New Britain Is.	124	12	8	12/13	41	0.58

Holocentrus angustifrons Ogilby, 1908 resembles *H. laevis* (= *F. argenteus*, see above) but was distinguished from *H. laevis* by its narrower interorbital width and 12 pectoral rays (Ogilby, 1908). The width of the interorbital may be a geographically variable character as mentioned above. The holotype of *H. angustifrons* has 12 pectoral-fin rays on the left side and 13 on the right (courtesy of Mr. R. J. McKay of the Queensland Museum). The authors found 12 pectoral-fin rays on one side of their specimens of *F. argenteus* as did Randall (1955) in *H. laevis* from the Gilbert Islands. We conclude that *H. angustifrons* is not separable from *F. argenteus*.

Flammeo achromopterus Fowler, 1904 was synonymized with *Holocentrus laevis* by Jordan and Seale (1906) and Fowler (1925). Re-examination of the holotype (ANSP 14141, by courtesy of Mrs. E. B. Böhlke) revealed that it has 13 pectoral-fin rays, the most diagnostic character of *F. argenteus*. Hence, *F. achromopterus* is a junior synonym of *F. argenteus*.

Rhynchichthys novae-britanniae De Vis, 1884 was synonymized with *H. laevis* by Jordan and Seale (1906) and Fowler (1928). The holotype of this species appears to be lost (personal communication from Mr. R. J. McKay). Since the description of *R. novae-britanniae* given by De Vis agrees fairly well with that of *F. argenteus*, it is probably a junior synonym of *F. argenteus*.

Remarks. One specimen (HUMZ 62975) is the only specimen with 12 dorsal-fin spines among all holocentrine fishes examined here. Woods (1953) reported only one specimen of *H. tiere* with 12 dorsal-fin spines.

This is the rarest species of *Flammeo* in Japan.

Flammeo sammara (Forsskal, 1775)
(Fig. 21)

(Japanese name: Ukeguchi-ittodai)

Sciaena sammara Forsskal, 1775: 48 (type locality, Djedda, Arabia).

Perca sammara; Bloch and Schneider, 1801: 89.

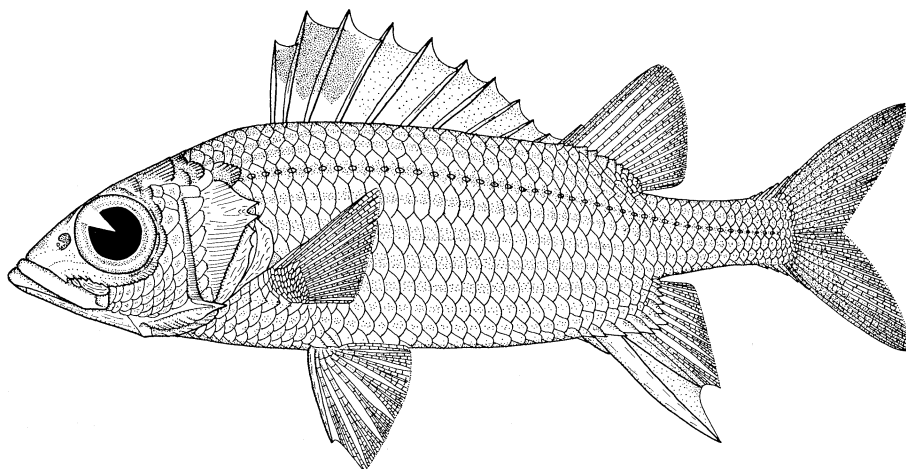


Fig. 21. *Flammeo sammara* (Forsskal, 1775), HUMZ 47366, 174.0 mm SL, Okinawa Is. Drawing by T. Shimizu.

Labrus angulosus Lacepède, 1802: 430, pl. 22-1 (type locality, Mauritius).

Holocentrus sammara; Rüppell, 1828: 85, fig. 22-3.

Holocentrum sammara; Cuvier, 1829: 216.

Holocentrum christianum Cuvier, 1829: 219 (type locality, unknown).

Holocentrum tahiticum Kner, 1864: 482 (type locality, Tahiti); 1865, fig. 1-2.

Holocentrum platyrrhinum Klunzinger, 1870: 725 (type locality, Red Sea).

Neoniphon armatus Castelnau, 1875: 5 (type locality, Cape York, Australia).

Neoniphon hasta De Vis, 1885: 537 (type locality, Queensland, Australia).

Holocentrus fuscostriatus Seale, 1902: 69 (type locality, Guam Is.).

Flammeo sammara; Jenkins, 1904: 440.

Holocenthrus thorntonensis Fowler, 1904b: 231, fig. 4 (type locality, Thornton Is., Polynesia).

Holocenthrus (Kutaflammeo) tahiticus; Whitley, 1933: 69.

Holocentrus (Flammeo) sammara; Woods, 1955: 92.

Kutaflammeo sammara; Munro, 1967: 141, pl. 15-fig. 224.

Diagnosis. Pectoral-fin rays 13 or 14 (mostly 14). Anal-fin rays 7 or 8 (mostly 8). Spinous dorsal-fin membranes with black blotch between first and third spines.

Specimens examined. 31 specimens, 36.9~210.8 mm SL. HUMZ 40433, date unknown; 40434~40442, Apr. 29, 1973; 40444, Jul. 20,

1973; 40445, Jul. 28, 1973; 40475, Apr. 11, 1974; 40476, 40478, Apr. 8, 1974; 41442, May 4, 1975; 41452, May 5, 1975; 47366, Apr. 8, 1974; 47471, Apr. 4, 1974; 47373, Apr. 22, 1974; 47376, Apr. 8, 1974; 47378, Apr. 11, 1974; 47387, 47390, 47393, Apr. 8, 1974; 47403, Apr. 4, 1974; 47404, Apr. 12, 1974; 47405, Apr. 22, 1974; 47985, Mar. 6, 1974; 48035, Apr. 11, 1974. KSHS 10371, Aug. 8, 1969. Localities: Okinawa Is., Ishigaki Is., Okinawa Pref.; Okinoerabu Is., Kagoshima Pref.

Description. D. X-I, 11 or 12 (mostly 12), Pec. 13 or 14 (mostly 14), A. IV, 7 or 8 (mostly 8). Lateral-line scales 39~43 (usually 41 or 42). Scales 2.5 above, 8 below lateral-line. Gill rakers 5~8 (usually 6 or 7)+1+7~11 (usually 9 or 10)=14~19 (usually 16~18).

Head 2.9~3.2, body depth 3.0~3.6 in SL. Orbit 2.5~3.0; jaws, upper 2.2~2.4, lower 1.6~1.8; dorsal-fin spines, first 2.2~3.0, second 1.8~2.5, third 1.8~2.3; anal-fin spines, third 1.1~1.5, fourth 1.8~2.2 in HL. Snout 1.1~1.3, interorbital 1.3~1.6 in orbit diameter.

Body slender, spinous dorsal-fin high. Head profile gently curved. Spinous dorsal-fin base almost straight. Caudal peduncle rather slender. Snout rather long. Lower jaw protruding when mouth closed. Nostril large, without spination. Nasal bone and upper margin of first suborbital bone quite smooth. Lower margin of first suborbital bone with weak serrae. Lateral margin of frontal bone con-

vex, forming a distinct shelf over antero-dorsal portion of orbit. Interorbital wide, flat. Opercle with two short and sharp spines of almost equal length. Opercle with distinct striation. Preopercular spine short, about one-third of orbit. Dorsal-fin spines slender, the first slightly shorter than the second, the second almost equal to the third, the third the longest. First dorsal-fin spine close to second one. Spinous dorsal-fin membranes incised. Pectoral-fin triangular and small. Anal-fin spines sharp. Body scales finely serrated, slightly striated on posterior margin.

Color when fresh: Spinous dorsal-fin membranes with a black blotch on distal two-thirds between first and fourth dorsal spines; a small, triangular white spot just behind base and tip of each dorsal spine; the rest of fin brick red. Dorsal-fin spines brick red. Dorsal portion of head and nape dusky brick red. Ground color of body silvery white. Body scales with a dusky spot on its center, these spots forming longitudinal bands. Lateral-line scale row with a distinct brick red stripe. Cheek scales with a central dark spot. Anterior margin of soft dorsal-fin brick red, the rest of fin yellow. Pectoral-fin red. Pelvic-fin pale. Third anal-fin spine white, spinous anal-fin membranes brick red, fourth anal-fin spine dusky, the rest of fin yellow. Anterior margin of both caudal-fin lobes white, a few outer rays brick red, the rest of fin yellow. Inner face of pectoral-fin axil coffee brown.

Synonymy. *Labrus angulosus* Lacepède, 1802 was synonymized with *Holocentrum sammara* by Cuvier (1829). It was also regarded as *Holocentrus (Flammeo) sammara* by Bauchot (1970) based on the examination of the holotype. The figure of *L. angulosus* (Lacepède, 1802, pl. 22-1) is clearly that of *F. sammara*.

Rüppell (1828, 1835) justly regarded *Holocentrum christianum* Cuvier, 1829 and *Holocentrus sammara* to be conspecific.

The original description of *Holocentrum tahiticum* Kner, 1864 and the second description by Kner (1865) have some discrepancies as pointed out by Günther (1875). The second, more detailed description (Kner, 1865: 9) indicated a species quite different from *H. tahiticum*, although the figure of *H. tahiticum* (Kner, 1865, fig. 1-2) is completely that of

F. sammara. Thus, *H. tahiticum* is thought to be conspecific with *F. sammara*.

Holocentrum platyrrhinum Klunzinger, 1870 was placed in the synonym of *H. sammara* by Klunzinger (1884).

Neoniphon armatus Castelnau, 1875 and *Neoniphon hasta* De Vis, 1885 were synonymized with *H. sammara* by Woods (1955) who presented a detailed discussion.

Holocentrus fuscotriatus Seale, 1902 was synonymized with *H. sammara* by Jordan and Seale (1906) and Fowler (1928). The description by Seale coincides well with that of *F. sammara*.

Holocentrus thorntonensis Fowler, 1904 was synonymized with *H. microstomus* by Fowler (1928). However, Jordan and Seale (1906), Weber and de Beaufort (1929) and Herre (1953) placed it in synonymy with *H. sammara*. Examination of the holotype (ANSP 23769) of *H. thorntonensis* revealed that it has the 11th dorsal-fin spine nearer to the first dorsal ray, the spine about equal in length to the 10th dorsal spine, 11 dorsal rays, eight anal rays, 14 pectoral rays and 40 lateral-line scales (courtesy of Mrs. E. B. Böhlke and Dr. W. F. Smith-Vaniz). These characters plus the pigmentation of the spinous dorsal-fin membranes indicate that this species is conspecific with *F. sammara*.

Remarks. This is the commonest species of *Flammeo* in Japan.

Flammeo opercularis (Valenciennes, 1831)

(Fig. 22)

(Japanese name: Hireguro-ittodai)

Holocentrum operculare Valenciennes, 1831: 501 (type locality, Carteret Harbor, New Ireland Is.).

Holocentrus opercularis; Seale, 1906: 24.

Holocentrus (Flammeo) opercularis; Woods, 1955: 92.

Kutaflammeo operculare; Munro, 1967: 141, pl. 15-fig. 221.

Flammeo operculare; Gushiken, 1972: 24, fig. 99.

Flammeo opercularis; Bagnis and others, 1974: 239, with fig. (not numbered).

Diagnosis. Anal-fin rays 9. Spinous dorsal-fin membranes almost entirely black, with an

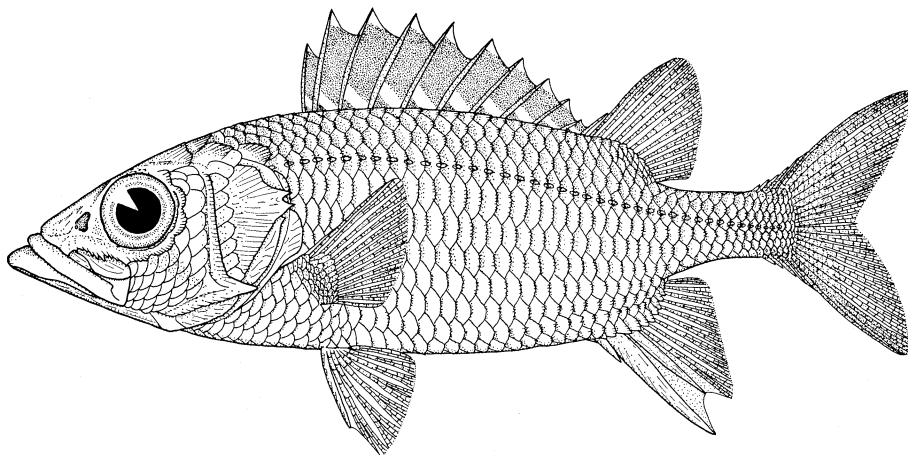


Fig. 22. *Flammeo opercularis* (Valenciennes, 1831), HUMZ 40460, 230.4 mm SL, Okinawa Is.
Drawing by T. Shimizu.

oblique white band on lower portion of each membrane.

Specimens examined. Nine specimens, 165.5~245.8 mm SL. HUMZ 40257, Apr. 22, 1974; 40413, date unknown; 40460, 40461, May 6, 1974; 40462, Apr. 13, 1974; 40463, Apr. 22, 1974; 62873, Apr. 15, 1977. KSHS 15545, May 6, 1975; 16880, Nov. 4, 1975. Locality: Okinawa Is., Okinawa Pref.

Description. D. X-I, 13, Pec. 13 or 14 (usually 14), A. IV, 9. Lateral-line scales 38~40. Scales 2.5 above, 8 below lateral-line. Gill rakers 6 or 7+1+10 or 11 (usually 11)=18 or 19.

Head 2.9~3.1, body depth 3.1~3.3 in SL. Orbit 3.0~3.5; jaws, upper 2.1~2.2, lower 1.5~1.7; dorsal-fin spines, first 3.1~3.6, second 2.4~2.8, third 2.2~2.7; anal-fin spines, third 1.5~1.9, fourth 2.0~2.7 in HL. Snout 0.8~1.0, interorbital 1.2~1.5 in orbit diameter.

Body elongate, rather compressed. Head profile and spinous dorsal-fin base gently curved. Caudal peduncle rather short. Snout long. Lower jaw protruding well beyond upper when mouth closed. Nostril very large, without spination. Nasal bone and upper margin of first suborbital bone smooth. Lower margin of first suborbital bone with weak serrae. Lateral margin of frontal bone convex, forming a distinct shelf over antero-dorsal portion of orbit. Interorbital rather narrow, flat. Opercle with two sharp spines of almost equal length. Opercular bones with distinct

striations. Preopercular spine short, less than half of orbit. Dorsal-fin spines slender, the first slightly shorter than the second, the second almost equal to the third, the third or fourth the longest. First dorsal-fin spine very close to second one. Spinous dorsal-fin membranes incised. Pectoral-fin small. Third anal-fin spine stout. Body scale finely serrated, not striated.

Color when fresh: Spinous dorsal-fin membranes jet black with an oblique white band at base of each membrane; small, triangular white spot just behind tip of each dorsal spine. Dorsal-fin spines dark red. Body silvery red, paler below. Body scales silvery red posteriorly, darker anteriorly. Cheek scales with a central dark spot. Opercle brick red. Anterior margin of soft dorsal-fin brick red, the rest of fin yellowish red. Pectoral-fin yellowish red. Anterior margin of pelvic-fin white, the rest of fin yellowish red. Cleithral region with an oblique dark red band.

Onomatology. As the gender of *Flammeo* is masculine, *operculare* is changed to *opercularis*.

Remarks. This fish is rather rare in Japan. Among the four species of *Flammeo* in Japan, this species may attain the largest size.

Flammeo scythrops Jordan et Evermann, 1904
(Fig. 23)

(Japanese name: Hohobeni-ittodai)

Flammeo scythrops Jordan and Evermann,
1904: 174 (type locality, Honolulu, Hawaii);

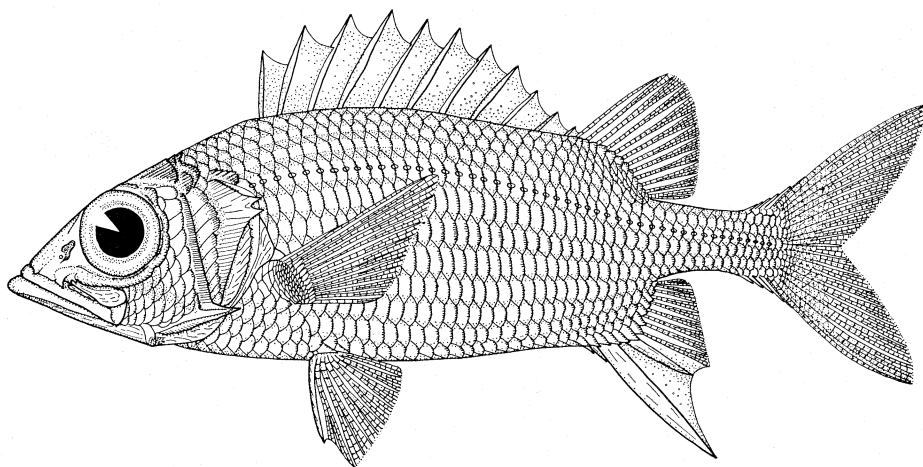


Fig. 23. *Flammeo scythrops* Jordan et Evermann, 1904, HUMZ 40500, 157.6 mm SL, Okinawa Is. Drawing by T. Shimizu.

1905: 157, fig. 57, pl. 7.

Holocentrus scythrops; Fowler, 1927: 8.

Diagnosis. Last dorsal-fin spine shorter than the penultimate one and nearer to first dorsal ray than penultimate spine.

Specimens examined. Ten specimens, 157.6~200.6 mm SL. HUMZ 49468, Apr. 22, 1974; 40469, Apr. 20, 1974; 40498, Apr. 22, 1974; 40499, Apr. 15, 1974; 40500, May 11, 1974; 40510, Apr. 5, 1974; 45300, Jul. 16, 1973; 62837, Apr. 13, 1977. KSHS 14291, Jul., 1973; 15172, Apr. 3, 1974. Localities: Okinawa Is., Okinawa Pref.; Kagoshima City, Kagoshima Pref.

Description. D. X-I, 12 or 13 (usually 13), Pec. 14, A. IV, 8 or 9 (usually 9). Lateral-line scales 44~46. Scales 3.5 above, 8 or 9 below lateral-line. Gill rakers 5 or 6+1+9 or 10 (usually 10)=16 or 17.

Head 2.8~3.1, body depth 3.0~3.3 in SL. Orbit 2.5~2.9; jaws, upper 2.0~2.3, lower 1.7~1.8; dorsal-fin spines, first 3.2~4.5, second 2.4~3.0, third 2.2~2.5; anal-fin spines, third 1.4~1.6, fourth 2.1~2.7 in HL. Snout 1.2~1.5, interorbital 1.6~2.1 in orbit diameter.

Body rather elongate. Caudal peduncle slender. Head profile gently curved. Spinous dorsal-fin base slightly curved. Soft dorsal-fin base not raised. Anterior tip of nasal bone round. Posterior portion of nasal bone smooth. Nostril large, without spination. Upper margin of first suborbital bone slightly

serrated. Lateral margin of frontal bone almost straight or slightly convex, forming a shallow shelf over antero-dorsal portion of orbit. Interorbital slightly convex. Lips thick. Lower jaw protruding well beyond upper jaw when mouth closed. Opercle with two flat, short spines; the upper slightly longer. Preopercular spine short, about one-third of orbit. Dorsal-fin spines high, slender. Last dorsal-fin spine shorter than penultimate one. Spinous dorsal-fin membranes incised. Third anal-fin spine long, slender. Body scales slightly striated and serrated.

Color when fresh: A red spot on anterior end of subopercle. Head, opercle and both lips red. A white band from snout tip to lower limb of preopercle. Ground color of body yellow. Each longitudinal body scale row with a red stripe. Dorsal-fin spines yellow. Spinous dorsal-fin membranes red with irregularly shaped yellow or whitish patches between second and tenth spines. Soft dorsal- and pectoral-fins red. Pelvic-fin pale red. Third anal-fin spine white, the rest of fin red. Caudal-fin red.

Remarks. *Flammeo scythrops* resembles the Atlantic species *F. marianus* in some meristic characters and coloration, but it is clearly separable from the latter in having 3.5 scales above the lateral-line (2.5 in *F. marianus*, judging from Fig. 15 of Woods, 1955) and 16 or 17 total gill rakers (19 or 20 total gill rakers given for *marianus* by Woods, 1955).

This species is rather rare in Japan.

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日本産イトウダイ亜科(キンメダイ目)魚類の再検討およびイトウダイ属1新種の記載

清水 長・山川 武

今日までに日本から知られているすべての種、西太平洋産の2種、さらに日本産の1新種を含むイトウダイ亜科2属18種の分類学的研究を行い、各種のシノニムを詳細に論じた。

この亜科には、イトウダイ属 *Adioryx* とウケグチイトウダイ属 *Flammeo* の2属が知られ、両者は背鰭第11棘の位置で区別される。この棘は、イトウダイ属では第10棘と背鰭第1軟条との中間に位置し、ウケグチイトウダイ属では背鰭第1軟条に極めて近く位置する。

イトウダイ属の分類には計数的形質のほかに、鼻骨後部の棘、鼻孔の棘および第1眼下骨上縁の棘もしくは鋸歯の有無が有効な形質である。本属の日本産10種、ハナエビス *A. furcatus*, トガリエビス *A. spinifer*, クラカケエビス (新称) *A. caudimaculatus*, スミツキカノコ *A. cornutus*, イットウダイ *A. spinosissimus*, アヤメエビス *A. ruber*, ホシエビス *A. lacteoguttatus*, アオスジエビス *A. tiere*, ニジエビス *A. diadema*, テリエビス *A. ittodai* および1新種バラエビス *A. dorsomaculatus* の記載が与えられた。この新種は鼻孔の後縁(時には前縁にも)に小棘をもつ、第1眼下骨上縁に鋸歯をもつ、鼻骨後部は平滑で棘をもたない、側線鱗数32~35、体色は全体に赤色で背鰭第1棘から第3棘の間の鰭膜の下方部に黒斑をもつなどの特徴により他のいずれの既知の種とも区別される。日本以外からのスミレエビス (新称) *A. violaceus*, ヒメエビス *A. microstomus*, サクラエビス (新称) *A. tiereoides* の3種を含めて、西太平洋産イトウダイ属14種の実用的検索が作製された。

ウケグチイトウダイ属4種は、背鰭第11棘の長さ、側線上方鱗数、胸・臀鰭条数および背鰭棘部鰭膜上の黒色斑紋の有無と形により容易に識別される。これら4種の記載と検索が与えられた。

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